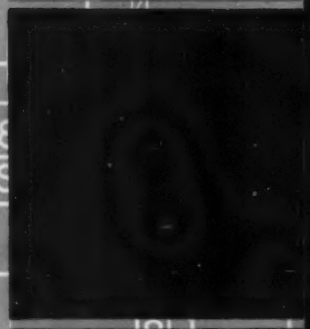
The Electrical Industry's Weekly Magazine

November 4, 1957

Electrical World

Price 50 Cents

A McGraw-Hill Publication



Underfrequency Relays . . . Prevent Complete System Shutdown . . . Speed Recovery

. . . p 71

Rate Forecast: Scattered Squalls . . . Page 58

E B POWER GS & L
UNIVERSITY MICROFILMS IN
313 N 1 ST
ANN ARBOR MICH C

Newest General Electric sound lab accelerates progress in solving transformer noise problems

NEWEST SOUND LAB—One of five such General Electric facilities—will study transformer sound and thermal characteristics to improve the Company's line of medium transformers (up to 10,000 KVA) and accessory equipment.

Electric utilities may expect further solutions to transformer noise problems through the continued study of sound phenomena—for this is the goal of engineers working at General Electric's newest laboratory, recently completed at Rome, Ga.

This new lab is the fifth research facility General Electric has built to investigate the cause and control of transformer noise. It, along with continuing field studies at existing utility substations, will accelerate the Company's progress in providing the electrical industry with both design improvements and highly useful information which result from extensive laboratory tests of commercial transformers and scale models.

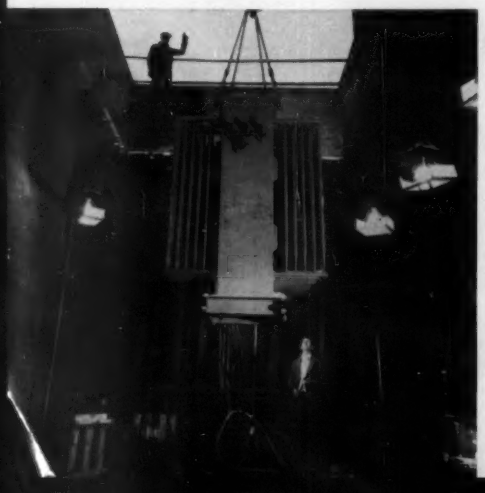
As increasing load density has required the location of more and more substations in residential areas, utilities have faced difficult customer relations problems. General Electric's leadership as a source of acoustical information has been increasingly valuable in helping utilities meet or avoid such problems.

For more information on what makes General Electric transformers good neighbors to the homes they serve, contact your General Electric Apparatus Sales Office. General Electric Co., Section 301-364, Schenectady 5, N.Y.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC



FIRST SOUND LAB at General Electric has made valuable contributions to transformer sound technology through hundreds of transformer noise investigations made during the last 19 years.

FIRST LARGE SOUND LAB helped G-E engineers develop new steel enclosure for extra-quiet transformers. Units with sound reductions of up to 21 decibels below NEMA levels are now economical for residential applications.

Electrical World

Vol. 148, No. 19 November 4, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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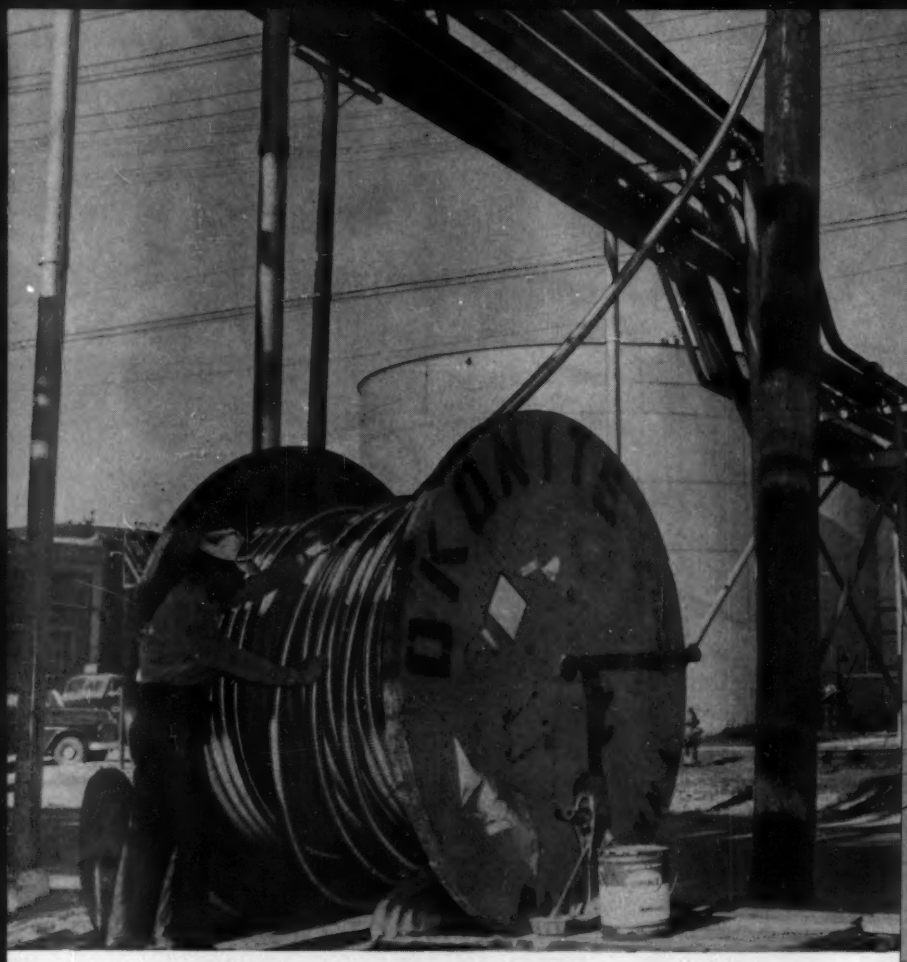

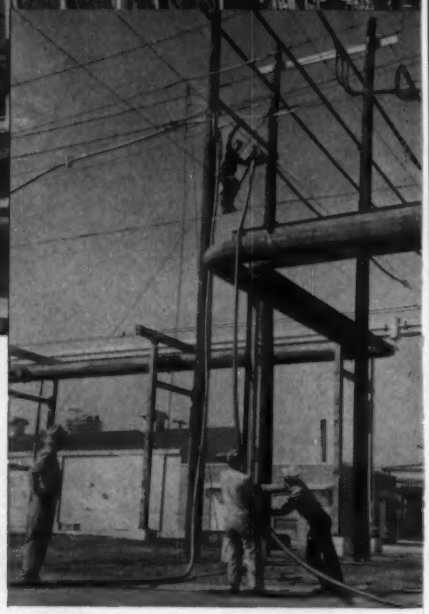

Installing 15,000-volt Loxarmor feeder (above). Single pulls as long as 1,600 feet were made around corners (right) without re-sorting to splices. A half-inch stainless steel messenger was used.

15kv Loxarmor® aerial feeders replace bare wires at refinery

In replacing bare wire aerial feeders that had proved unreliable in bad weather and had, on several occasions, shorted out and burned down, a Texas refinery installed nearly 8,000 feet of Okonite oil-impregnated, paper-insulated, lead-sheathed Loxarmor cable. Protected with an interlocking S-shaped bronze armor (Loxarmor), this cable has proved itself 100% reliable. The Loxarmor provides mechanical protection against movable drag lines, cranes, and the like.

Here is one example of how industry uses versatile Loxarmor cable—the modern conduit-type cable that's mechanically strong, flexible and versatile. For either power or control circuits, Loxarmor cable has proved itself time and again to be economical . . . easy to install indoors or outdoors . . . easy to move and re-route . . . easy to inspect and maintain . . . completely reliable and dependable.

Loxarmor can be supplied over any standard Okonite insulation, rubber, plastic, paper or varnished cambric—depending upon your installation conditions and voltage requirements. It is available in galvanized or stainless steel, aluminum or bronze. For full details, contact your local Okonite representative or write to The Okonite Company, Passaic, New Jersey.

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Fischer Black

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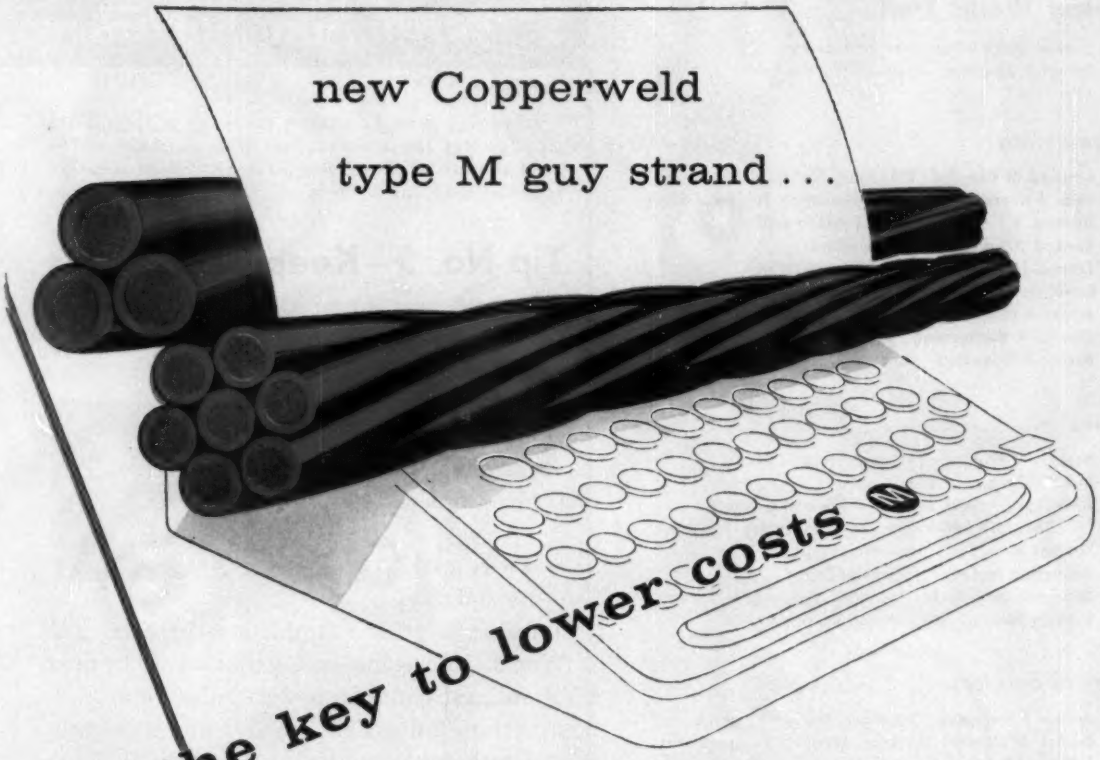

Copperweld* Type M Guy Strand offers double economy: 1. lower first cost, 2. lower maintenance costs. Research and new production techniques make it possible for us to manufacture Type M at savings which are passed on to you. The result is Copperweld quality costing you less than before. And the savings don't end after installation. They continue year after year because Type M Guy Strand requires so little maintenance. It will last as long as modern poles.

Seven strengths are available: 2.2M, 4M, 6M, 8M, 10M, 12.5M and 16M. Easo to handle—easy to install, Type M Guy Strand can be readily bent, served, moused or clamped. Write us today for complete information about this new product and its money-saving features.

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For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

2.2M 4M 6M 8M 10M 12.5M 16M

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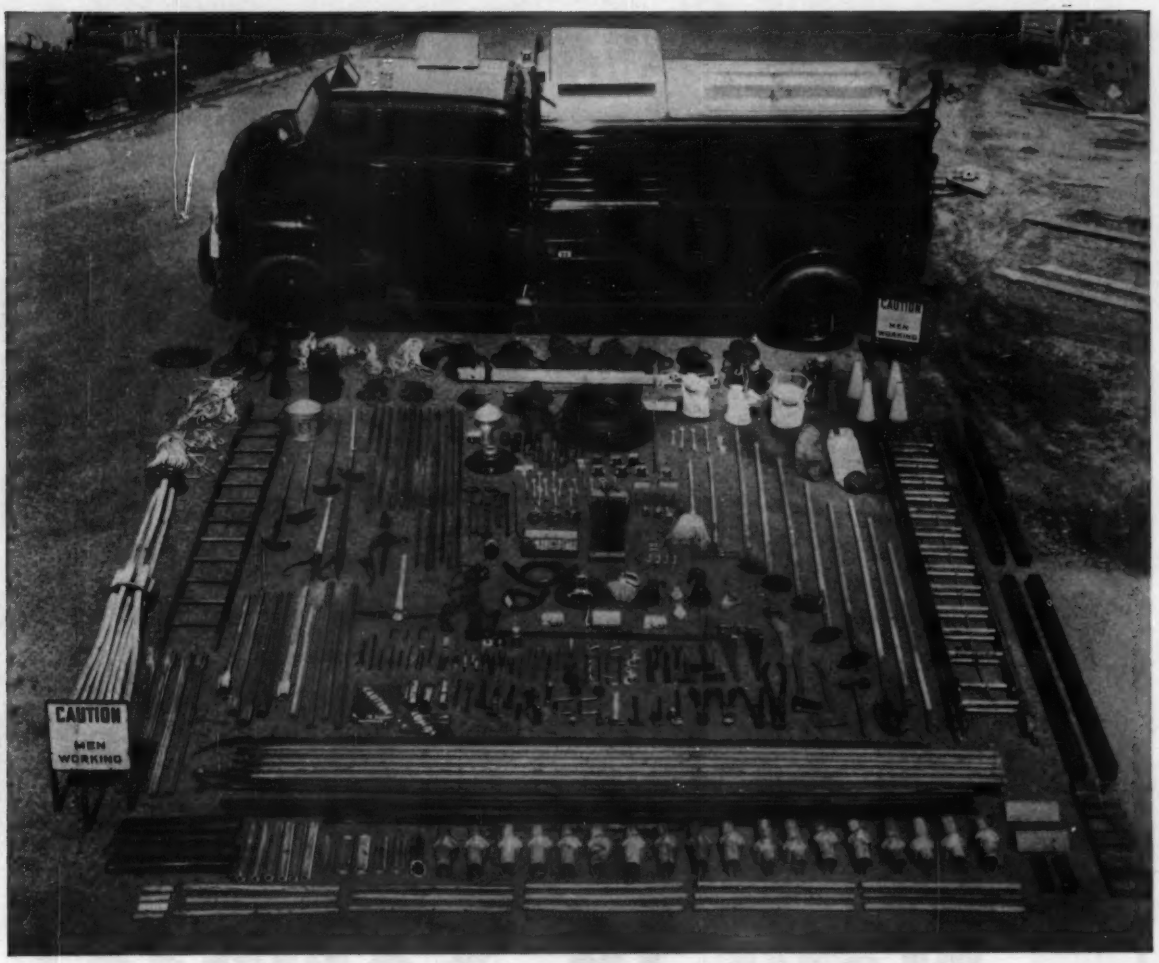

Look at your line truck equipment needs from this angle . . .

Here's a poles-eye view of a typical utility line truck showing the wide variety of construction and maintenance tools and safety equipment your linesmen need for most day-to-day jobs. But—without exception—each and every item shown can be ordered conveniently from your nearby Graybar office or warehouse . . . and in every case you get the type and quality needed to assure speed and efficiency on the job *plus* long years of satisfactory service. All are products your linesmen know and respect—products that have been tried, tested and proven in the field by scores of companies just like your own.

Remember, when you order "via Graybar", you save the time and expense of multiple inquiries, for you can select, from this single source, the items best suited to your needs from among the products of over 200 of the nation's leading manufacturers.

Graybar is thoroughly familiar with utility requirements. Further, your nearby Graybar Representative stands ready to help as a convenient source of information on everything needed for pole-line construction and maintenance. And should you be faced with an out-of-the-ordinary problem, call on the experience of a Graybar Outside Construction Specialist for a consultation. We'll welcome your inquiry!

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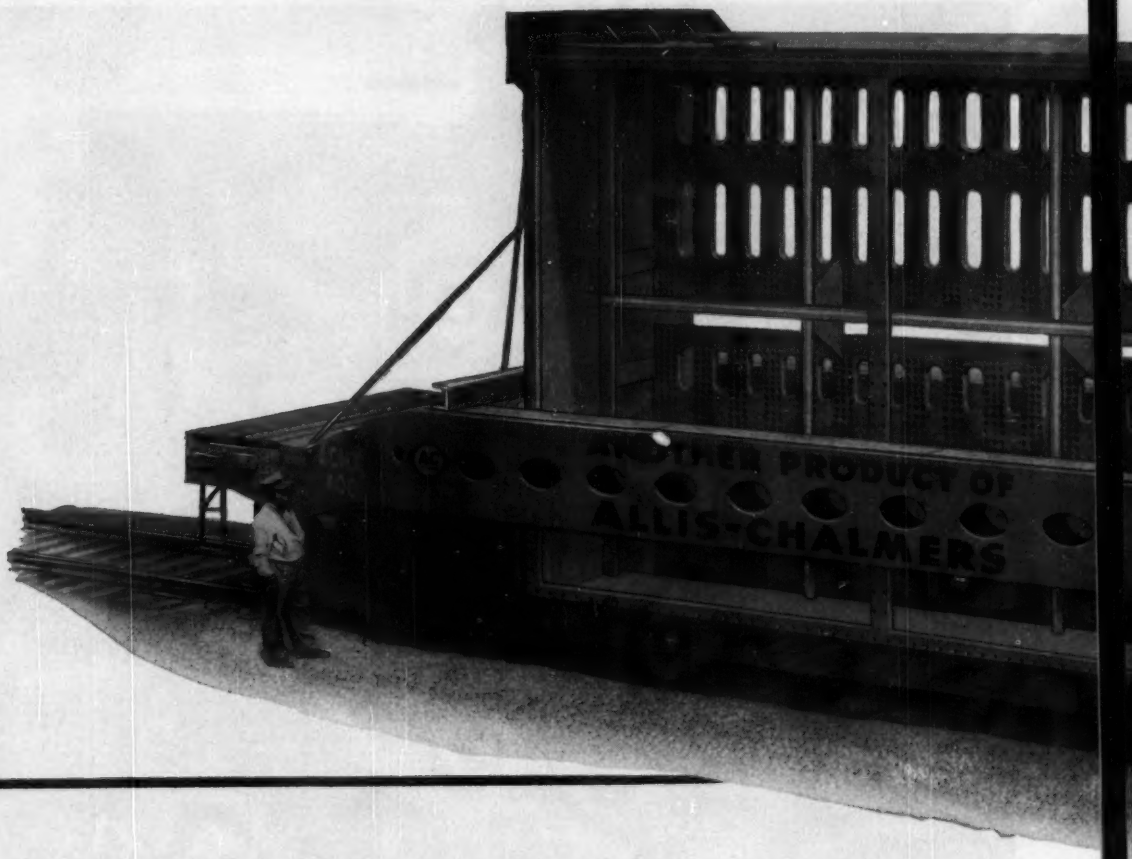
IN OVER 130 PRINCIPAL CITIES



Now in Service!

New well-center cars reduce condenser erection time and costs

For details, call your nearby A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin

A-C
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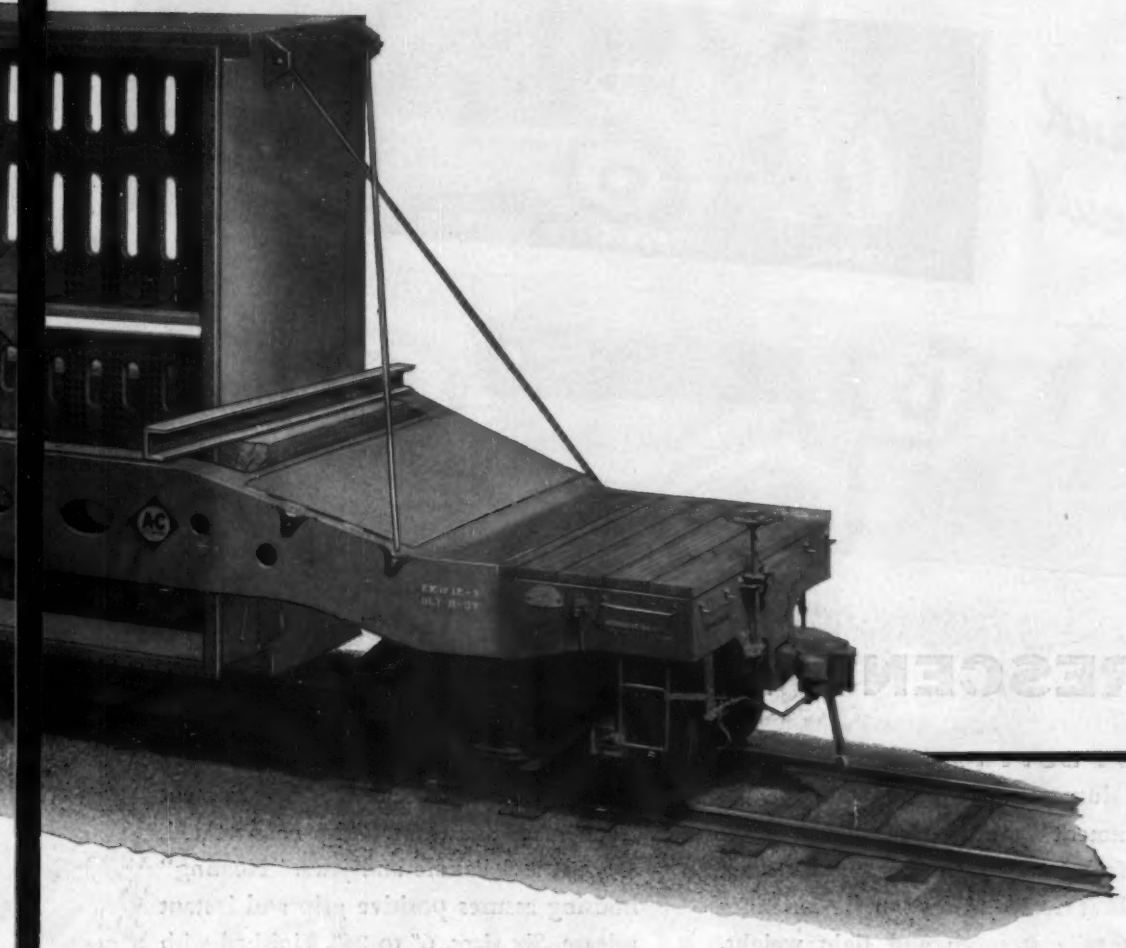
A-5453



These new Allis-Chalmers cars, specially built to A-C design, carry loads of greater dimension than any conventional car can handle . . . permit shipment of larger shell sections, cut erection time at the job-site.

With an overall width of 12 feet 7 inches, these cars take shell sections up to 30 feet long, 10 feet wide, 18 feet high. Cars used previously could take sections only 7½ feet wide.

This solution to the problem of transporting continually larger condensers to ever larger power plants is an example of the attention given to *all* the problems involved in building condensers — research, engineering, manufacturing, shipping, erecting, servicing. When you specify Allis-Chalmers you get complete engineering for optimum efficiency.

Matched Auxiliaries

Whatever your requirements may be in size or shape, Allis-Chalmers can supply surface condensers and all necessary auxiliaries — circulating pumps, condensate pumps, motors, air ejectors, controls, valves — all engineered by Allis-Chalmers.

ALLIS-CHALMERS

Brand New!

Ready Now!

CRESCENT PIPE WRENCHES

HEAVY DUTY PATTERN... A really heavy duty wrench, far exceeding U. S. Government Type II Specifications. Hook and Heel Jaws of special analysis steel, triple-heat treated. Alloy handle combines high tensile strength and light weight. Seven sizes, 6" to 24". Finished with flat surfaces polished...red enamel handles.

NORMAL DUTY (STILLSON) PATTERN... Meets U. S. Government Type I Specifications. Fully heat treated, forged steel handle and jaws. "Floating" housing assures positive grip and instant release. Six sizes, 6" to 24". Finished with flat surfaces polished...red enamel handles. Your jobber has these tools in stock now.

CRESCENT and CRESTOLOY TOOLS are sold by hardware dealers and industrial distributors everywhere. Look for the bright yellow Crescent Display panels and select from one of the world's greatest assortments of quality hand tools.

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"THE STRANDVISE STORY"

a fifteen minute sound-color film showing
the manufacture, testing and uses of Strandvise.
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RELIABLE ELECTRIC COMPANY

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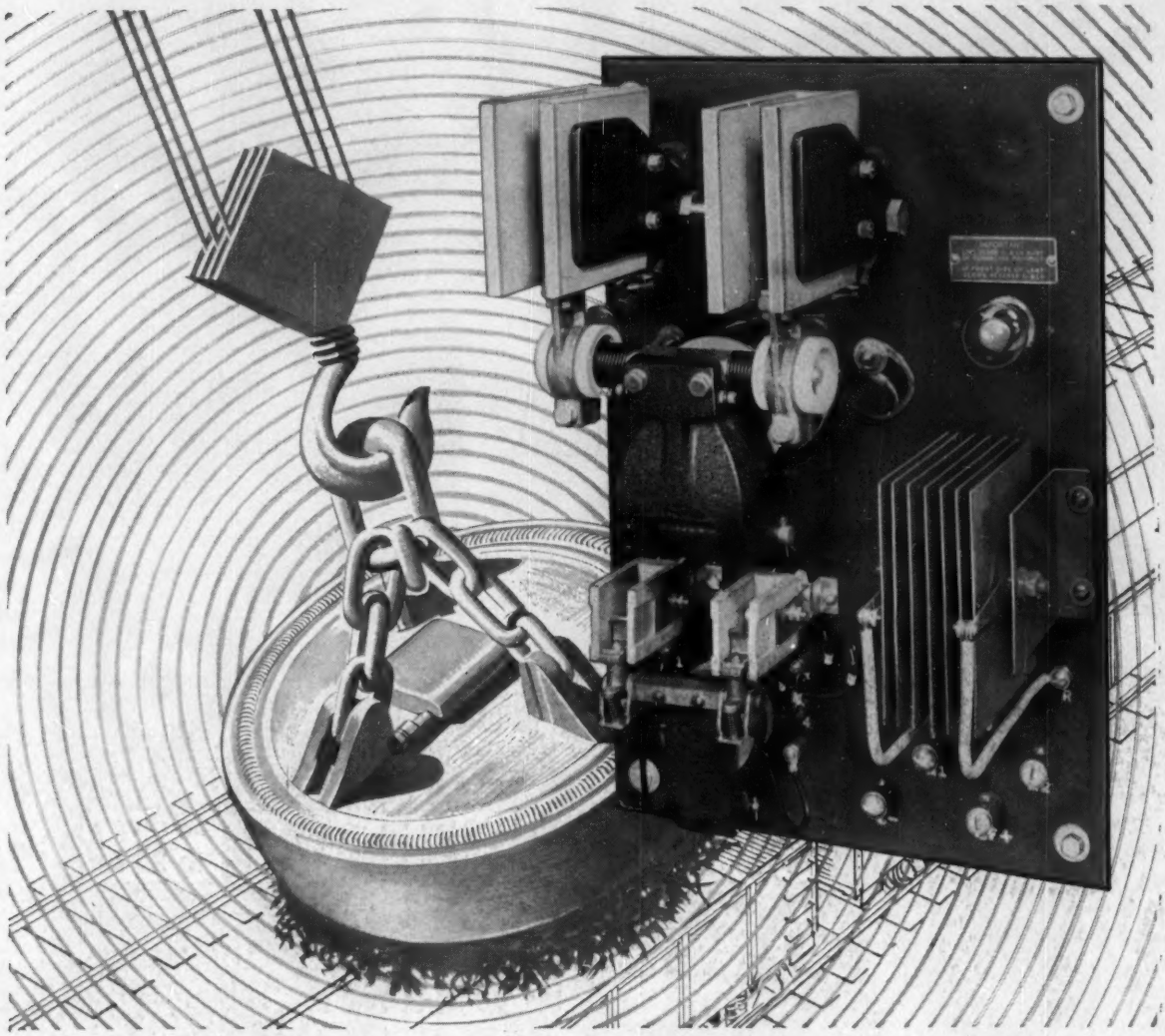


Ohio Electric Manufacturing Co. guards against arc damage *with J-M Ohmstone panels*

Ohio Electric Manufacturing Co. has long been known for the dependability and durability of their magnets. Exacting care is employed both in construction and selection of materials. Among these is Johns-Manville Ohmstone used as the panel board in the magnet control element. Especially designed and constructed for unusually dusty conditions, Ohmstone incorporates exceptional arc resistance and high dielectric strength.

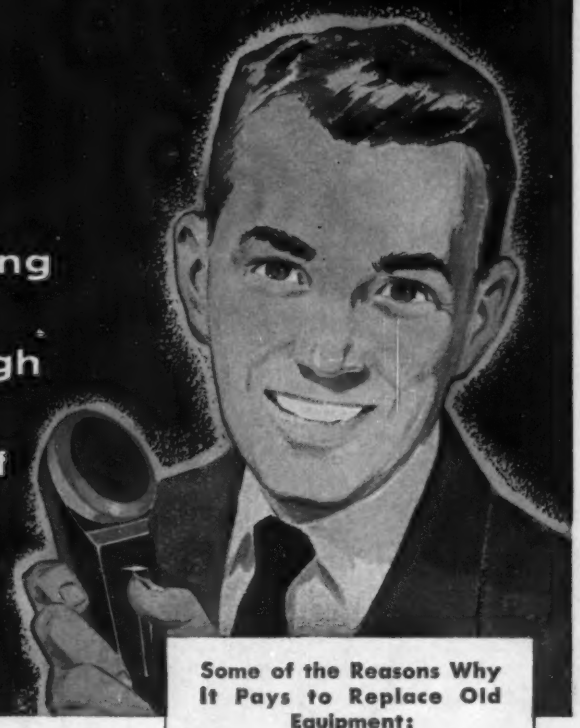
Made of asbestos, cement and a water-repellent ingredient, Ohmstone is bonded under pressure and impregnated with a non-carbonizing insulating compound. It withstands shock and vibration . . . won't rust or rot . . . resists water, oil, gas, ordinary chemicals and sudden temperature changes.

Ohmstone can be machined and drilled to accommodate apparatus. For further information write to Johns-Manville, Box 14, New York 16, N.Y. In Canada: 565 Lakeshore Road East, Port Credit, Ontario.

Johns-Manville OHMSTONE® AN ASBESTOS PRODUCT

REPLACE WITH RCA . . . AND SAVE!

You can own new RCA 2-Way Radio for what you are paying in inefficiency and high maintenance costs of obsolete equipment!



Some of the Reasons Why It Pays to Replace Old Equipment:

- *Improved performance from higher power*
- *Lower maintenance costs*
- *Reduction of downtime*
- *Opportunity for minimizing interference*
- *Improved operator morale*

The company that needs a new 2-way radio system is already paying for it in high maintenance costs and reduced efficiency. You're paying for the best—why not own it? With dependable new RCA mobile equipment, your investment will be protected for tomorrow with 6/12 volt interchangeability, and easily changeable components to provide split-channel operation. You'll get these plus assurances of lowest standby battery drain and low tube replacement costs, simplified "rainbow tuning," and other quality features only offered by the leader in radio and electronics.

An RCA Communications Representative will gladly explain how easy it is to own this dependable RCA equipment, including low-cost RCA financing and services of the RCA Service Company to keep your equipment operating at its peak. Mail coupon below for complete details.

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Radio Corporation of America
Communications Products
Camden, N. J.

RADIO CORPORATION OF AMERICA
Communications Products
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☐ Have RCA Communications Specialist make FREE radio survey of my business

NAME_____ TITLE_____
COMPANY_____
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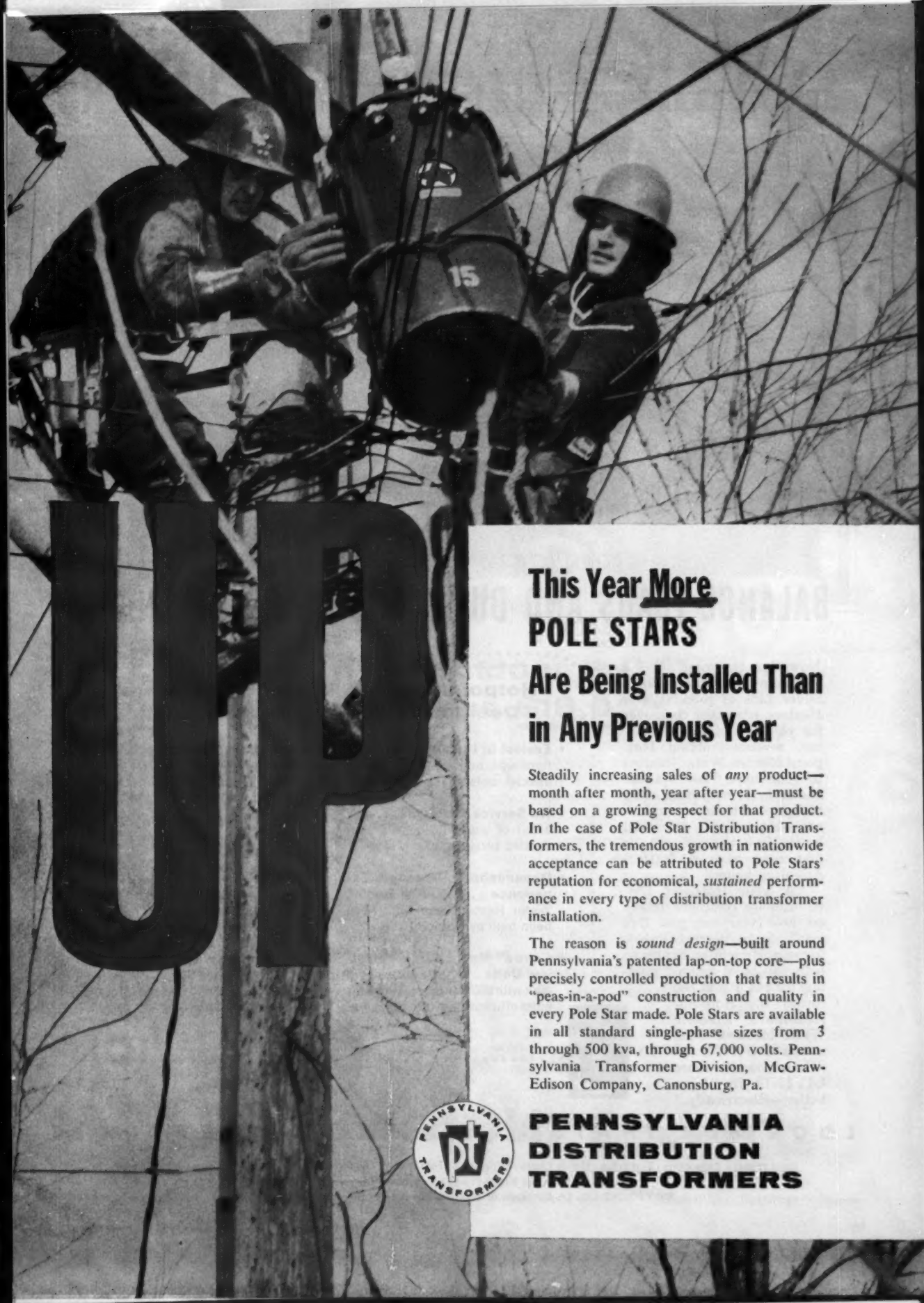
GOING



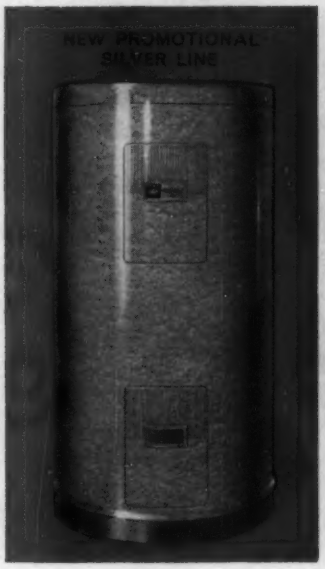
This Year More POLE STARS Are Being Installed Than in Any Previous Year

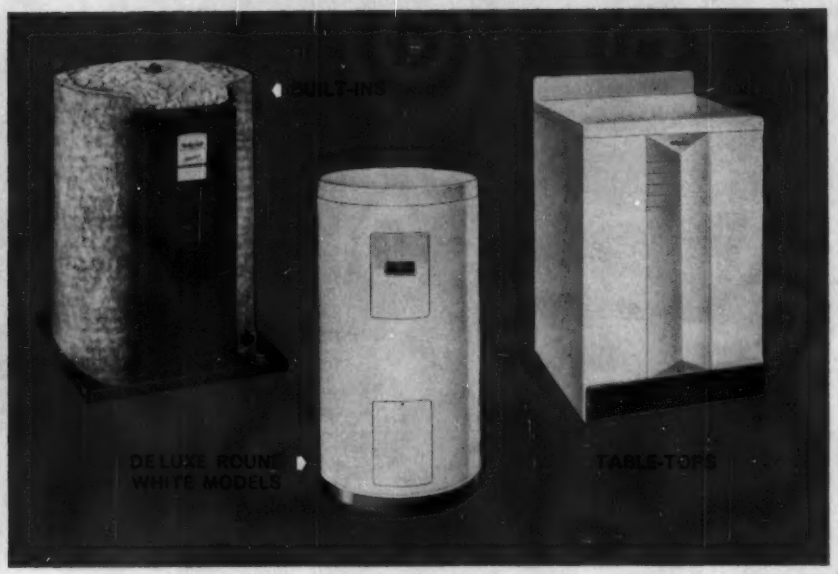
Steadily increasing sales of *any* product—month after month, year after year—must be based on a growing respect for that product. In the case of Pole Star Distribution Transformers, the tremendous growth in nationwide acceptance can be attributed to Pole Stars' reputation for economical, *sustained* performance in every type of distribution transformer installation.

The reason is *sound design*—built around Pennsylvania's patented lap-on-top core—plus precisely controlled production that results in "peas-in-a-pod" construction and quality in every Pole Star made. Pole Stars are available in all standard single-phase sizes from 3 through 500 kva, through 67,000 volts. Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

PENNSYLVANIA DISTRIBUTION TRANSFORMERS

Hotpoint ELECTRIC WATER HEATERS



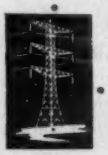


...a complete line that helps you

BALANCE LOADS AND BUILD SUSTAINED REVENUE!

Now that Hotpoint offers a complete new promotional Silver Line of round Water Heaters, it's easier than ever for you to add load-balancing, revenue-building Hotpoint Electric Water Heaters to your lines. There's a size and style for *every* need, *every* budget. And their tremendous *pre-sold* popularity is proved by the fact that they are the first choice in over 1,500,000 American homes!

Ask your Hotpoint Distributor for complete details on how you can put this established preference to work for you. He will be happy to help you build assured revenue for today and the future—with Hotpoint Automatic Electric Water Heaters! Puts more POWER in "Housepower"—more LIVING in "Live better—Electrically."



Hotpoint Electric Water Heaters are Designed to Sell . . . Built to Last!

- **Easiest to Install** . . . no tricky hook-ups, no long pipe runs, no special tools or skills needed.
- **No Service Problems** . . . only 3 out of every 1,000 have ever needed servicing of any kind!
- **Dependability Through Experience** . . . ⅓ of all Electric Water Heaters ever built have been built by Hotpoint!
- **Calrod® Magic Circle® Heating Units** . . . grip outside of tank with 200 pound pressure for more efficient heat transmission.
- **Automatic Thermostats** . . . mounted directly on tank for sensitive, accurate temperature control.
- **Finest Fibre Insulation** . . . permits storage of hot water for 3 days without heating.

PLUS

Copper Hot Water Trap • "Hot-Dip" Galvanized Steel Tank • Cold Water Baffle • Listed by Underwriters' Laboratories, Inc. • Full Hotpoint Warranty • Quick-Recovery Super-Speed Models and Cement-Lined Perma-Stone Models also available.

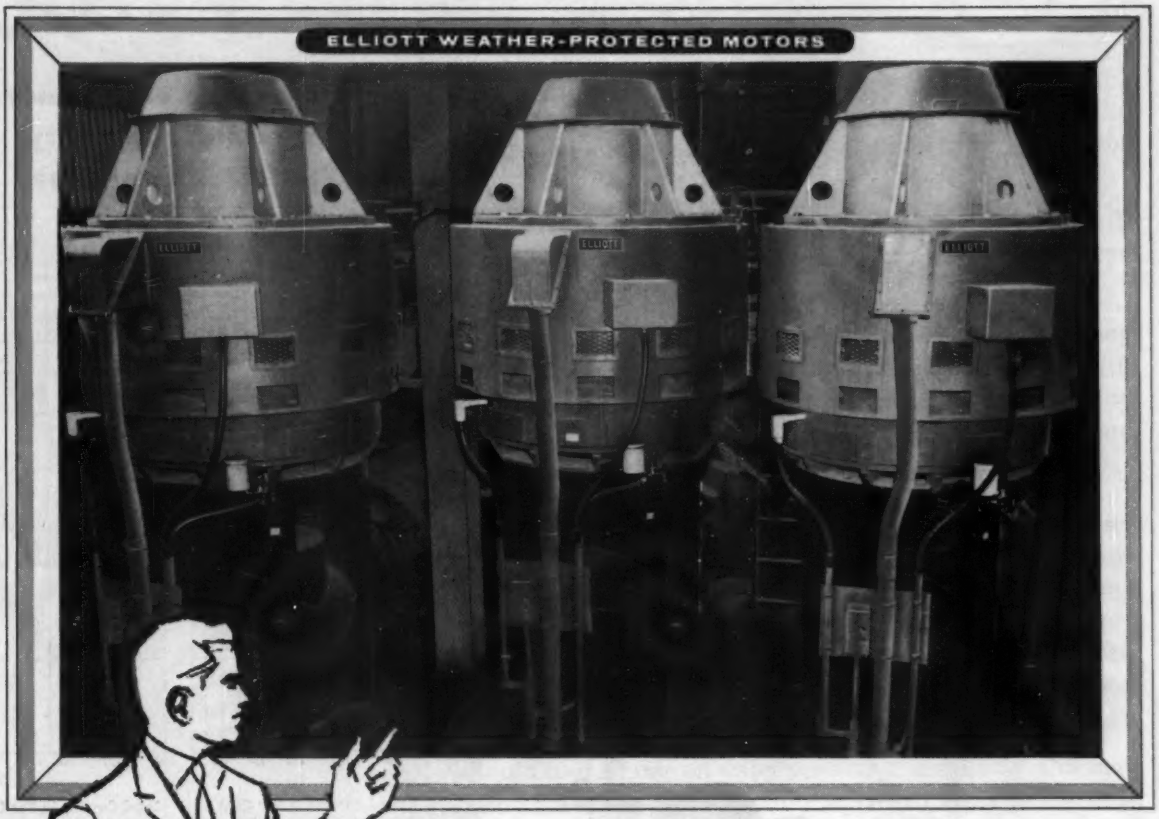
LIVE BETTER ELECTRICALLY

LOOK FOR THAT Hotpoint DIFFERENCE!

Water Heaters • Dishwashers • Disposalls® • Electric Ranges • Refrigerators • Food Freezers • Air Conditioners • Automatic Washers • Clothes Dryers • Combination Washer-Dryers • Customline • Television •

HOTPOINT CO. (A Division of General Electric Company), CHICAGO 44

ELLIOTT WEATHER-PROTECTED MOTORS



R7-8

"This outdoor installation saved us $18,000"

Three Elliott 450-hp, 720-rpm, hollow-shaft weather-protected induction motors above drive pumps through shafts 65 feet long.

A well-known chemical plant decided to build a new pumping station on the Mississippi River. It planned to construct a special building in which totally-enclosed fan-cooled motors were to be installed. Naturally, construction like this runs into a lot of money.

Elliott Company engineers suggested using Elliott weather-protected motors mounted on a caisson. Since such motors are designed to withstand rugged outdoor use, a building was unnecessary. In the completed outdoor installation, pictured above, the savings added up to $18,000.

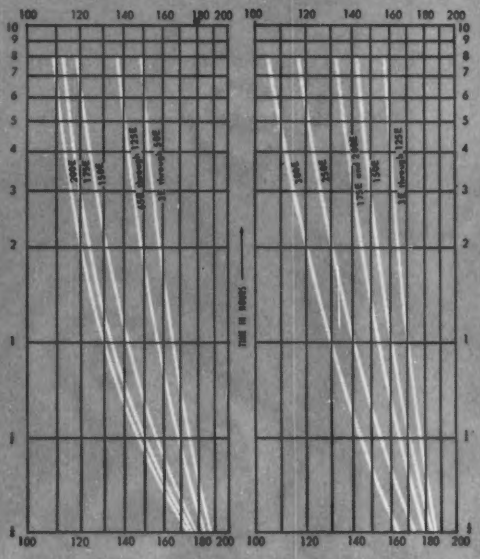
The same thing could happen to you. The economy of outdoor construction has been proven in installations from coast to coast. In all kinds of weather—rain or shine, snow or sleet—Elliott motors keep right on operating. Having unparalleled experience with outdoor motors, Elliott engineers are in a unique position to serve you. For quick action, contact your nearby Elliott District Office or write Elliott Company, Ridgway Division, Ridgway, Pa.

ELLIOTT Company

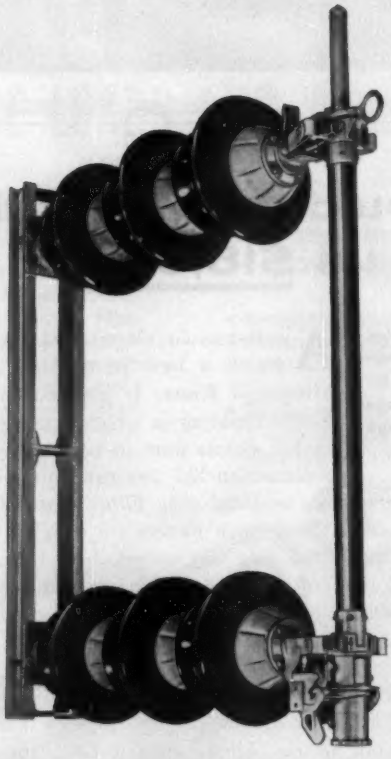
Turbine-Generators • Turbines • Motors • Generators • Deaerating Heaters • Ejectors • Condensers • Compressors • Turbochargers • Tube Cleaners • Strainers

ELECTRICAL NEWSLETTER

short-time emergency overload capability for SMD Power Fuses


100 120 140 160 180 200
10 9 8 7 6 5 4 3 2 1
TIME IN HOURS
Load Current in Per Cent of SMD-1 Fuse Unit Ampere Rating
Load Current in Per Cent of SMD-2 Fuse Unit Ampere Rating

now... even for overloads you can match power fuses to power transformers



The pressure is on to obtain maximum utilization of power transformer capacity. This pressure has led to precise evaluation of transformer short-time overload capabilities—for both daily peaks and occasional emergencies.

To keep pace, S&C has made correspondingly precise evaluations of the overload capabilities of its power fuses.

The result: (1) New fusing tables (minimum ampere rating recommendation) which recognize short-time daily overload and (2) new curves (see above) which permit you to subject power fuses to extreme short-time overload during emergencies, as when one transformer picks up the load of another.

All of this is part of a new method for power fuse selection contained in a 16-page package—Data Bulletin 262. For your copy, write to S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

S&C ELECTRIC COMPANY

NEWS-SCOPE

FUTURE NEWS ▶ **More engineering manpower is likely to be available to utilities** in the near future. But on a long-term basis, this appears to be a transient situation.

Because of rising costs, a number of industrial groups reportedly will take a "long hard look" at their nuclear reactor programs with an eye toward curtailing their activities.

Where railroad routes parallel those desired for transmission lines, utilities will look with growing favor to negotiating rights-of-way with railroads. Advantages: Comparative freedom from encroaching structures; protection against vehicular traffic; and ability to negotiate large R/W sections with a single property owner.

LATE NEWS ▶ **Fire in N. Y. Central transformer vault triggers series of troubles** that plunge Grand Central Terminal area in large-scale blackout during station's rush hour of 50,000 commuters. Almost simultaneously, a second fire broke out in another transformer, and a 13,000-v Consolidated Edison feeder line nearby short-circuited. A railroad spokesman reports the entire ac network was out. Actual cause was undetermined as EW went to press.

The U. S. should concentrate on water reactors, even though this may require slowing down the effort on more advanced types of reactors, said W. Kenneth Davis, AEC's director of reactor development, at recent fourth annual Atomic Industrial Forum meeting. He said water reactors can be developed during the next ten to fifteen years to a point where they can compete with conventionally fueled plants in a substantial portion of the U. S. . . . **Uranium purchasing program of the AEC** will be kept at its present level, AEC's Jesse Johnson told the AIF. He said no cutback in the commission's own uranium requirements is planned.

Highlights of last week's NARUC meeting in Memphis: Faster "growing inflation" will impose additional responsibilities on regulatory commissions, said committee on rates . . . **Regardless of immediate economic consideration,** the generation of electricity by nuclear fission under the auspices of private utilities is rapidly approaching, claims nuclear energy group. Now that initial stage is past and data on peacetime uses of the atom has become available to all, federal monopoly is no longer warranted, it said.

AEC temporarily throws in the sponge on trying to encourage private firms to undertake chemical reprocessing of spent fuel elements from research and power reactors. Firms feel required investment and risks outweigh prospective income from volume of work available.

Congratulations . . . Clifford B. McManus rises to chairman of the board of The Southern Co to succeed the late Eugene A. Yates . . . Cincinnati G&E Pres Walter C. Beckjord is named president of the Association of Edison Illuminating Companies.

ELECTRICAL WEEK

A TWO-MINUTE

EVENTS ▶ **Vallecitos atom plant generated its first commercial power** Oct. 24. Its reactor is slated for developmental tests relating to Commonwealth Edison's 180-Mw Dresden station **(p 60)** . . . Special AEC staff recommends that construction permit for PRDC's Fermi plant be continued **(p 64)** . . . AIEE debates EHV lightning troubles **(p 65).**

WASHINGTON ▶ **The sanctity of government contracts** based on Hoover Dam power may be threatened by the impounding of Colorado River water behind the new Glen Canyon Dam in the future. This was charged at a hot debate last week before Interior and Reclamation officials **(p 61).**

GENERATION ▶ **An oil-immersed silicon rectifier has proved to be satisfactory** as part of an electrostatic precipitator power supply. In a trial installation at New York State Electric & Gas' new Millikan station, the rectifier converts high voltage ac to dc. The device is rated at 70 kv peak and 500 ma average current. As result of this successful test, silicon rectifiers are being made commercially for several precipitators. One will be used to clean 1.2 million cfm of flue gas at 275F at a 96.5% efficiency **(p 78).**

DISTRIBUTION ▶ **You can apply 50-kvar capacitors underground** without appreciably shortening their lives, but capacitor case temperature must not exceed 158F at rated voltage, or 139F at 110% rated voltage. If it climbs above those values, then the capacitors should be switched off during light load, or the vault should be forcibly ventilated. That is the finding of a research team which ran laboratory and field tests on capacitors, with an eye on the venerable "8-degree"rule governing insulation life **(p 74).**

SUBSTATIONS ▶ **Blending substations with their surroundings** to make them "congenial" community elements is the object sought by Windsor (Ont.) Utilities Commission in its beautification program. Old substations get a complete face lifting as facilities are enlarged or replaced. In business sectors, substations are cloaked in commercial-type buildings. In residential areas, they may be disguised as ranch-type houses. One new residential unit cost $70,000, including equipment but not land; its building alone cost $15,000 **(p 70).**

RELAYING ▶ **To improve service continuity,** Florida Power & Light applies underfrequency relays at generating plants, intra-system ties, and substations. The object is to prevent a complete system failure during major disturbances — such as when a plant is lost. This approach also hastens load recovery, although breakers are reclosed manually. The relay chosen for this job works in six cycles. It drops load on a priority basis, the highest-priority load getting the lowest of three permissible relay settings. In addition to specific applications, the authors discuss methods investigated for preventing false tripping **(p 71).**

PREVIEW OF THIS WEEK'S ELECTRICAL WORLD

INDUSTRIAL ▶ Converting an archaic brewery from homemade dc to "store-boughten" ac yielded an 80% savings in coal usage and cut labor costs 20%. This, plus a doubling of refrigeration capacity, helped rescue a faltering company from its competitive handicap (p 86).

MANAGEMENT ▶ When a company grows large and decentralized, it becomes vital that all executives act harmoniously on company business. A clear statement of policy is invaluable in eradicating inconsistencies, and provides furthermore the objectives of the company. West Penn found that it needed to write down its policy. It started by defining "policy," and objectives, and stating how these objectives were to be reached. It also set up machinery for changing or originating policy, and for spreading policy to three top levels of management (p 62).

FINANCE ▶ Pacific Gas & Electric Co has won a 5.16% rate increase which is expected to add $16.9 million a year to revenues. This will give PG&E a 5.75% rate of return (p 113).

RATES ▶ Inflationary pressures are predisposing utilities toward higher tarriffs. These include cost of money, labor, and equipment. One commission says it sees no indication that the cost of money will drop. Technology offset spiraling building and operating costs for years, enabling utilities to generate a kwhr at record efficiencies. But now it is significant to note that the cost of fuel per kwhr has started climbing upward (p 58).

HEATING & COOLING ▶ Six Ohio companies will show the latest in electric heating equipment and installation techniques to architects and consultant engineers this month. This is another example of a trend toward recognizing the role that these professionals will play in selling electric heat. The show will be part of a two-day conference on electric heat (p 84).

PEOPLE ▶ Edison Electric Institute has appointed Walter B. Gesell director of economics "on a short-term basis." Gesell is retiring as vice-president in charge of operations for Oklahoma G&E . . . Norman R. Schultz will succeed retiring David K. Blake as General Electric's manager of power distribution engineering, user industries sales department (p 118).

MANUFACTURERS ▶ Sangamo Electric has developed a line of secondary power capacitors for installation at the meter box. The line was developed to provide an economical way to correct customer power factor (p 104).

NEW EQUIPMENT ▶ Oil interrupters for horizontally mounted air switches work on 46 and 69 kv and have 600-amp current ratings . . . Line-puller, powered by 1/3-hp gasoline engine, rolls on 4-in. pulleys along existing line, pulling a throw line with it (p 88).

ENGINEERING TRENDS

Potable water can be produced from brackish water with high salt content by the use of ion-permeable membranes. Principle of operations is that brackish water flows through a cell formed from two ion-permeable membranes. One of the membranes is permeable to positive, and the other to negative ions. Electric current is passed through the cell between two electrodes. The ions forming the salinity are attracted toward the electrodes according to their electrical charge.

Temperatures of 2,000,000 deg C will soon be obtained with experimental fusion production apparatus in England.

Estimated costs of large nuclear power plants do not presently appear to be sensitive to the specific reactor type proposed.

Nuclear reactors are more critical in operation than fossil-fuel-fired boilers, from a time standpoint. More automatic protection devices are therefore needed.

Sulfur hexafluoride gas is claimed to be not only a good dielectric but also an exceptionally effective arc quenching medium. But the high cost of SF_6 compared to air and the need for disposing of the discharged gases make its use undesirable in blast-type breakers exhausting to atmosphere.

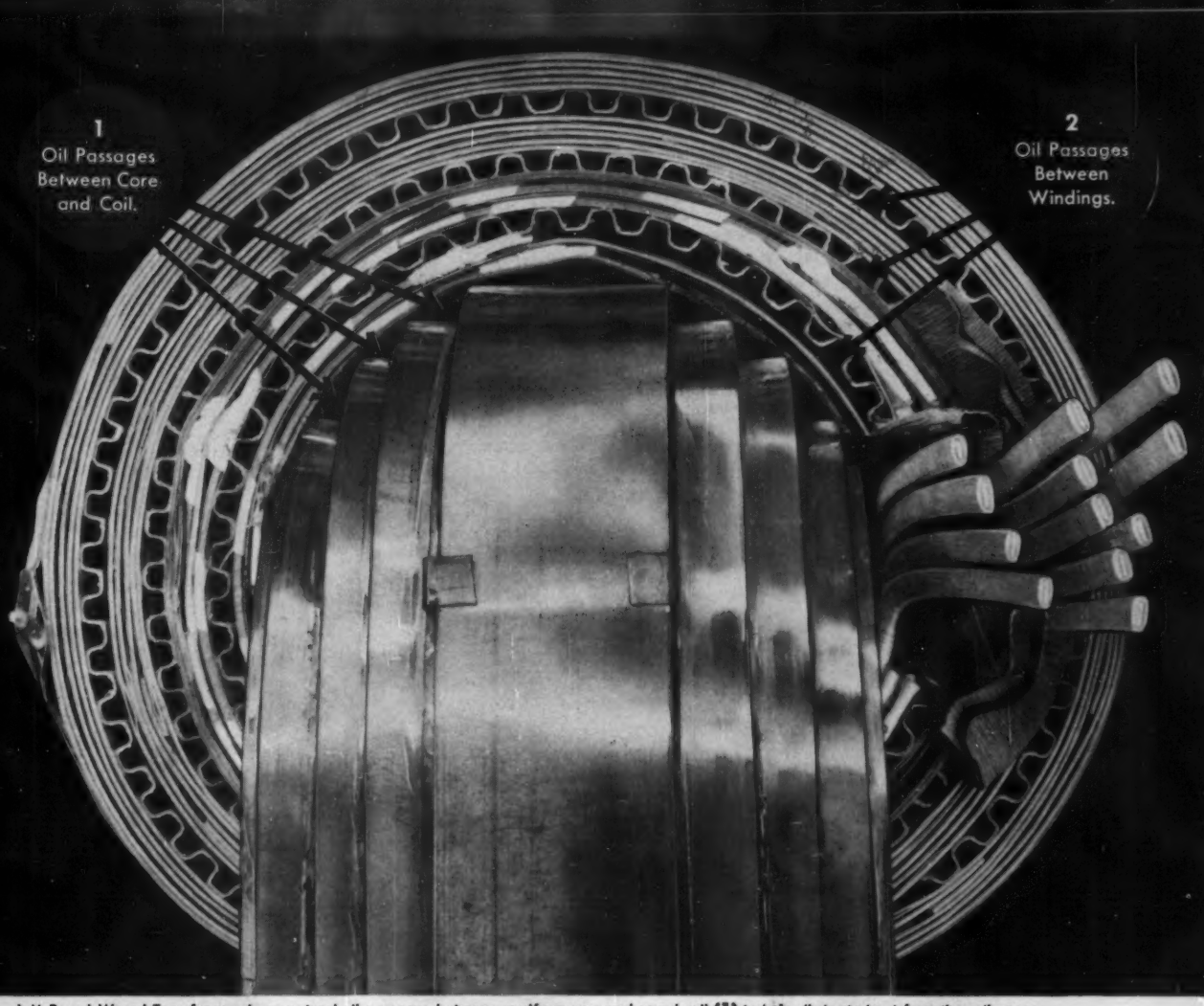
Painting either aluminum or copper buses increases their emissivity and results in lower temperature rises for a given current.

Use of tidal energy for power generation may soon become a reality. French engineers will shortly start construction of a tidal power plant on the fast-flowing Rance river.

Conversion of coal to oil may prove to be more economical than it has been in the past. Experiments by the British Fuel Research Board on the Fischer-Tropsch process have been sufficiently encouraging to warrant further investigation.

FROM EDITORS IN THE FIELD

Costs of measuring loads in vaults on its ac network system have been cut in half by a new method developed by Commonwealth Edison. It uses a small split-core current transformer and an indicating thermal ammeter with a push-up maximum indicator. The CT is clamped to the steel ring around the base of the network protector bushing; the ammeter is fastened to the wall of the vault. Both are permanently installed. The ammeter reads total vault load; load current is measured in one phase only.



L-M Round-Wound Transformers have natural oil passages between cruciform core and round coil **(1)** to help dissipate heat from the coils more rapidly. In addition, ducts provided by spacers placed between windings **(2)** and between layers in most sizes provide additional oil circulation.

Why More Customers Are Selecting L-M Round-Wound® Transformers

Many factors enter into transformer selection. Here are some of the reasons for the great increase in customer preference for L-M's obround-shape Round-Wound transformers.

Balanced Performance: The core is a continuous wound strip of oriented steel. Coils are wound directly onto this core. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux. This results in low exciting current and core loss.

The wound-core, round-coil design permits fewer winding turns and smaller turn diameter. This results in low impedance, and provides better regulation at all power factors.

Higher Uniform-Impulse Level: Round coils are wound into shape. Therefore, insulation is not damaged by malleting into rectangular shape. Coils have longer creepage distance between windings and between leads.

Higher Short-Circuit Strength: Round coils are not stressed out of shape under high radial short-circuit forces. Strong steel frame, heavy clamping bolts, sturdy maple blocks and varnished coils prevent axial movement.

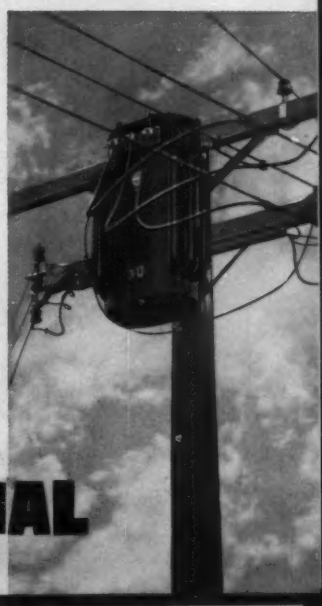
Higher Short-Time Overload Capacity: Round coils and the cruciform cross-section core expose large surfaces to cooling oil. The result is relatively low hot-spot temperatures, which add considerably to high short-time overload capacity.

Additional Capacity on Pole: L-M's new obround tank design makes the unit smaller and lighter, with shorter moment arm from the pole. This combination reduces bending moment on the pole and crossarms, and thus greatly increases potential capacity of existing transformer structures.

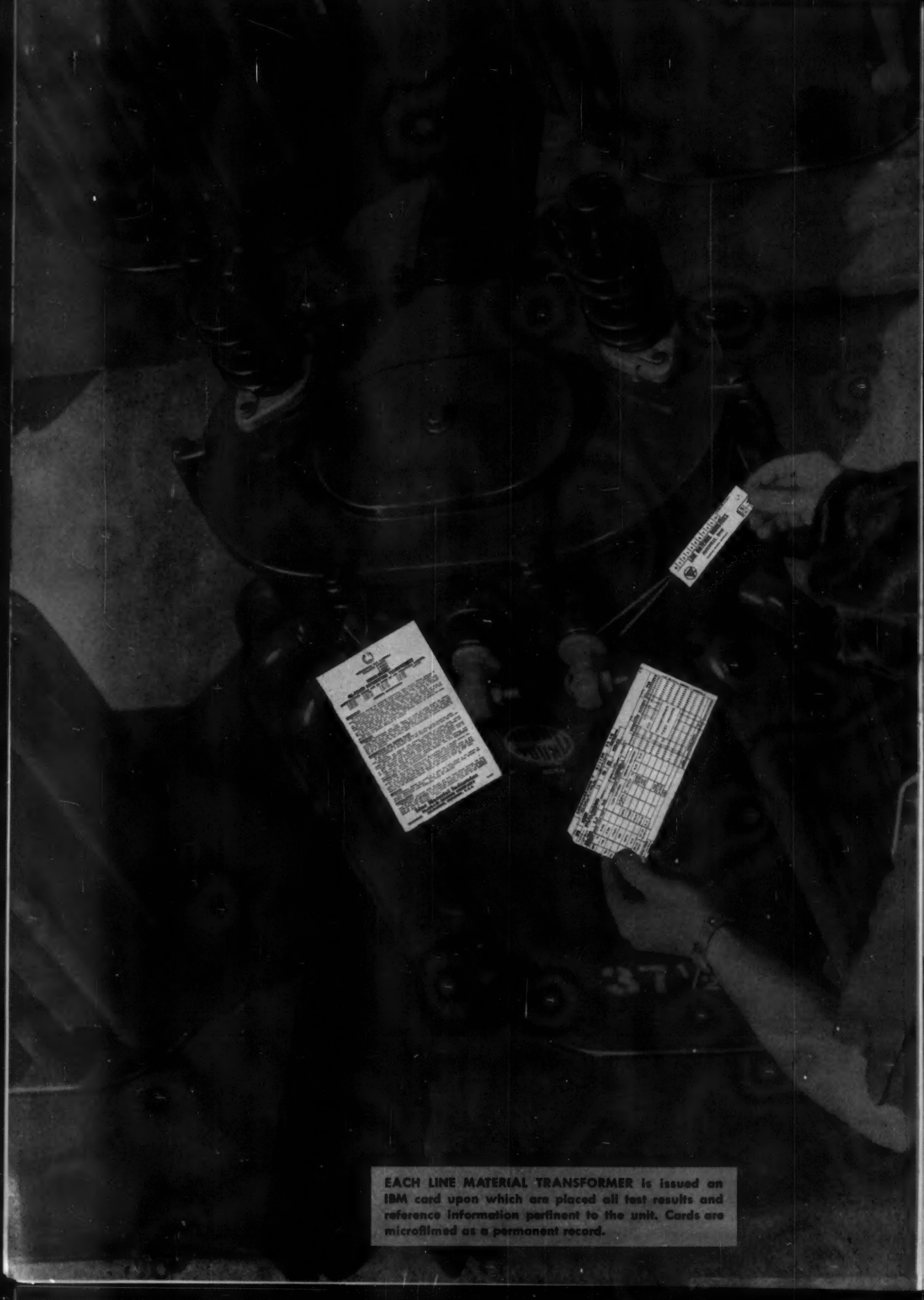
Get Complete Information

Ask your L-M Field Engineer for complete information and bulletins on L-M's Round-Wound Transformers. Or write Line Material Industries, Transformer Division, Zanesville, Ohio.

235-R



LM® **LINE MATERIAL**
McGRAW-EDISON COMPANY



EACH LINE MATERIAL TRANSFORMER is issued an IBM card upon which are placed all test results and reference information pertinent to the unit. Cards are microfilmed as a permanent record.

How L-M's Quality-Control System Insures High Transformer Standards

By **ROBERT P. THOMPSON**
Manager of Engineering
Transformers
Line Material Industries

Performance characteristics of L-M Round-Wound® transformers are outstanding. Physical features are exceptional. Quality is *built in* to L-M transformers, not tested in. To make doubly sure of maintaining uniformly high quality, L-M has established a very tight quality-control system.

Continuous tests are made—from raw materials to finished product. A final assurance of quality is the permanent microfilmed record of test information kept on every L-M transformer.

CORE TESTING: The tolerance permitted in testing the bare core of L-M's Round-Wound transformer is much more stringent than required by NEMA and ASA of core performance in the completed transformer.

The specially trained craftsmen who make Round-Wound transformers take pride in the high quality of their work—no small contribution to the continued excellence of Round-Wound transformers and their amazingly low failure rate—less than 2/10 of 1 percent!

Check on Incoming Materials

All raw materials and parts for L-M Round-Wound transformers are rigidly and systematically inspected. For example:

- Every high-voltage porcelain bushing is subjected to acceptance dielectric tests.
- Samples of all wire are tested for resistance and cross-section uniformity; coating is tested for dielectric strength, adherence, thickness.
- The cold-rolled oriented silicon steel used in making L-M's wound core is tested for physical and magnetic characteristics by means of a precision Epstein tester. Rigid standards on the loss and permeability characteristics are maintained.

In-Process Tests

A continuous "in-process" testing and inspection program is followed throughout the plant. Cores are tested for magnetic characteristics before and after copper coils are wound upon them. Coils are checked for ratio and given a mechanical inspection immediately after being wound. All finished units are thoroughly tested for leaks.

COIL RATIO TEST: Ratio and polarity are checked immediately after the coil is wound, so as to maintain close surveillance of the coil-winding operation at all times.

When the unit is completed, every transformer is given a complete series of electrical tests in strict conformity with NEMA and ASA standards. These tests include core loss and excitation current, copper loss and impedance, ratio, induced voltage, high potential, polarity, and impulse.

Certificate of Test

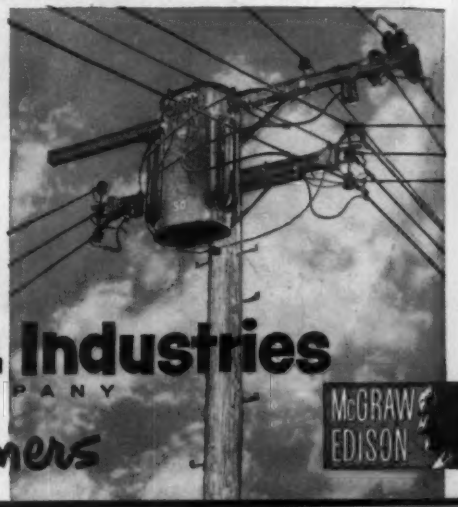
Each transformer is issued an IBM card which follows the unit through to completion. The card provides space for all test results. It is punched or filled in at each inspection and test station if, *and only if*, the transformer satisfactorily meets all the requirements of NEMA standards and of the L-M engineering and quality-control departments.

When the transformer is shipped, the cards are microfilmed and then stored to provide actual test data throughout the life of the transformer. This complete test information can be furnished to you at any time on any transformer.

Compare L-M's high standards of performance and outstanding physical features with other transformers; you will see why more customers are specifying L-M Round-Wound transformers.

Get Complete Information

Ask your L-M Field Engineer for complete information on the outstanding performance characteristics of L-M Round-Wound transformers and on L-M's unique obround tank. Or write Line Material Industries, Milwaukee 1, Wisconsin.

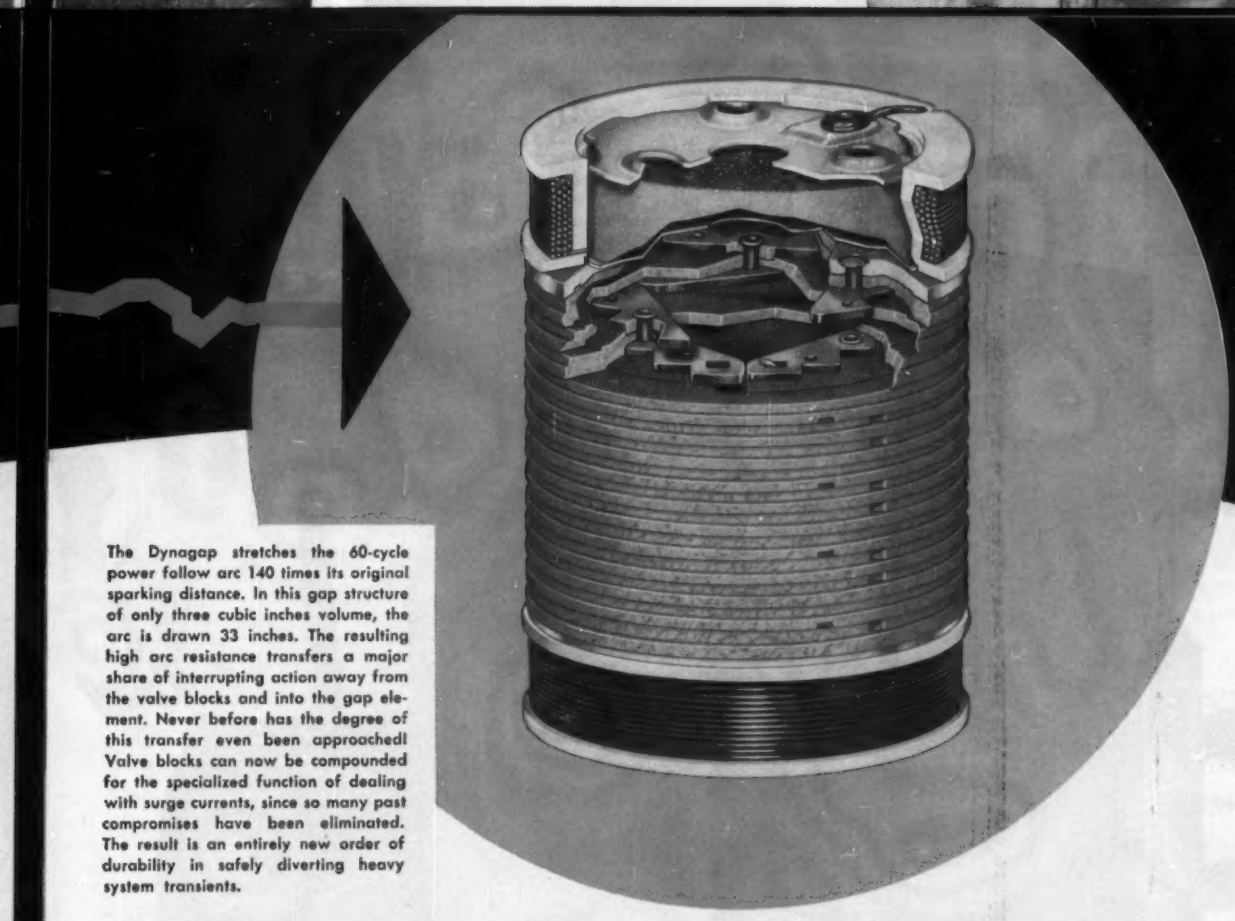


LINE MATERIAL Industries
McGRAW-EDISON COMPANY

Transformers

McGRAW EDISON

Biggest Lightning Arrester Bargain



The Dynagap stretches the 60-cycle power follow arc 140 times its original sparking distance. In this gap structure of only three cubic inches volume, the arc is drawn 33 inches. The resulting high arc resistance transfers a major share of interrupting action away from the valve blocks and into the gap element. Never before has the degree of this transfer even been approached! Valve blocks can now be compounded for the specialized function of dealing with surge currents, since so many past compromises have been eliminated. The result is an entirely new order of durability in safely diverting heavy system transients.

Thorex Type GP - Greatly Improved with New Dynagap... Still Leads in Lowest Protection Cost Per kv.

Introduced in 1950, this arrester combined the essential requirements of major station service with an "economy grade" price. It greatly broadened the use of first class arrester protection. Based on its excellent performance, it is presently the choice of many power systems.

Now, the Thorex Type GP has been drastically improved. It is equipped with the remarkable new Dynagap. It retains all its original fine protective features, but has gained an entirely new order of durability under the impact of heavy surge currents.

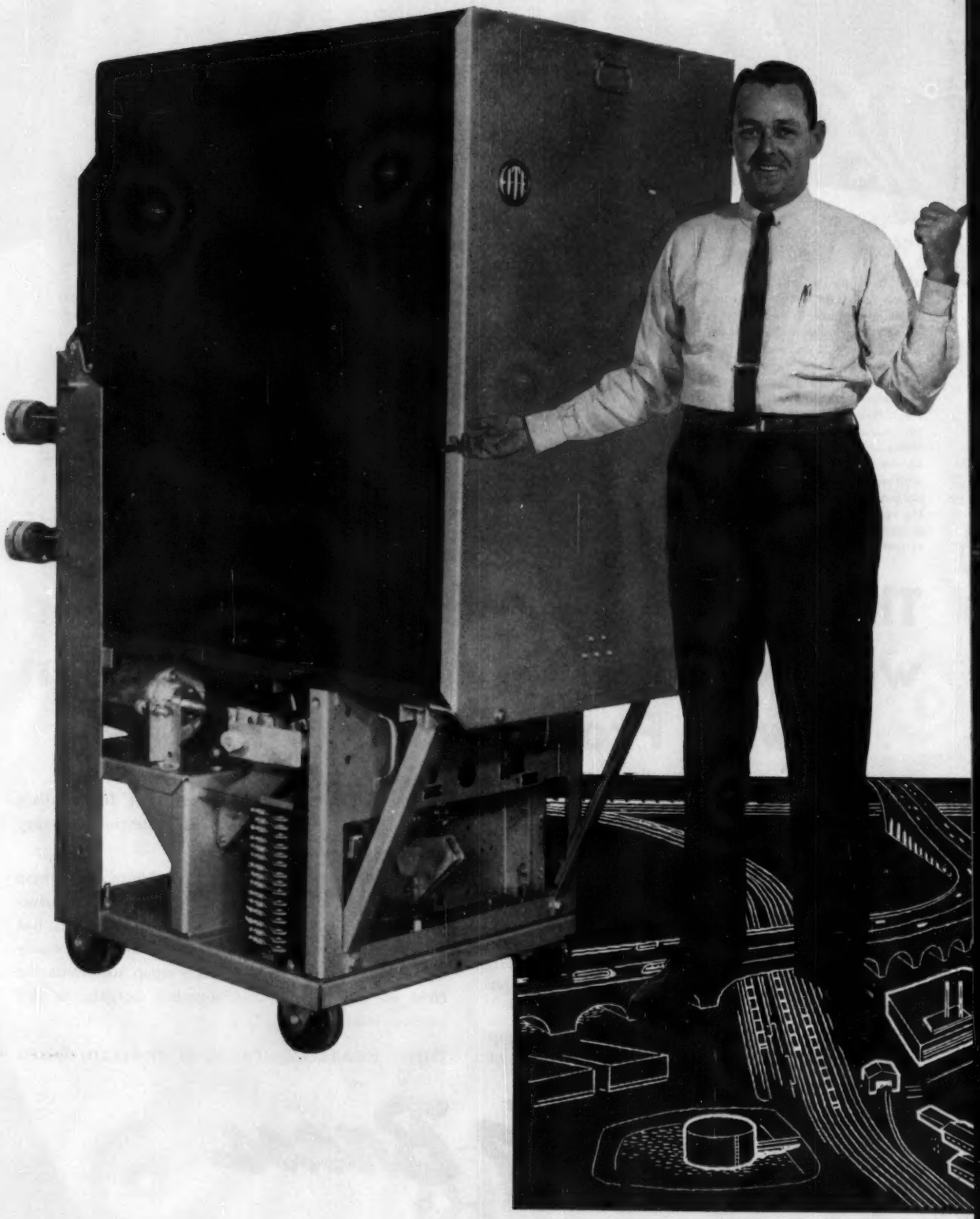
Better than ever—the new Type GP Thorex Dynagap lightning arrester brings many essential elements of station performance to an arrester of Intermediate Class, and still offers this reliable protection at a very attractive saving.

You will find it economically feasible to apply these arresters at many points where better apparatus insurance or higher service continuity are desirable, but where budgets may have ruled against the use of costly equipment. Type GP Thorex Dynagap still leads the field as the biggest and soundest bargain in the arrester industry.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

4781-H

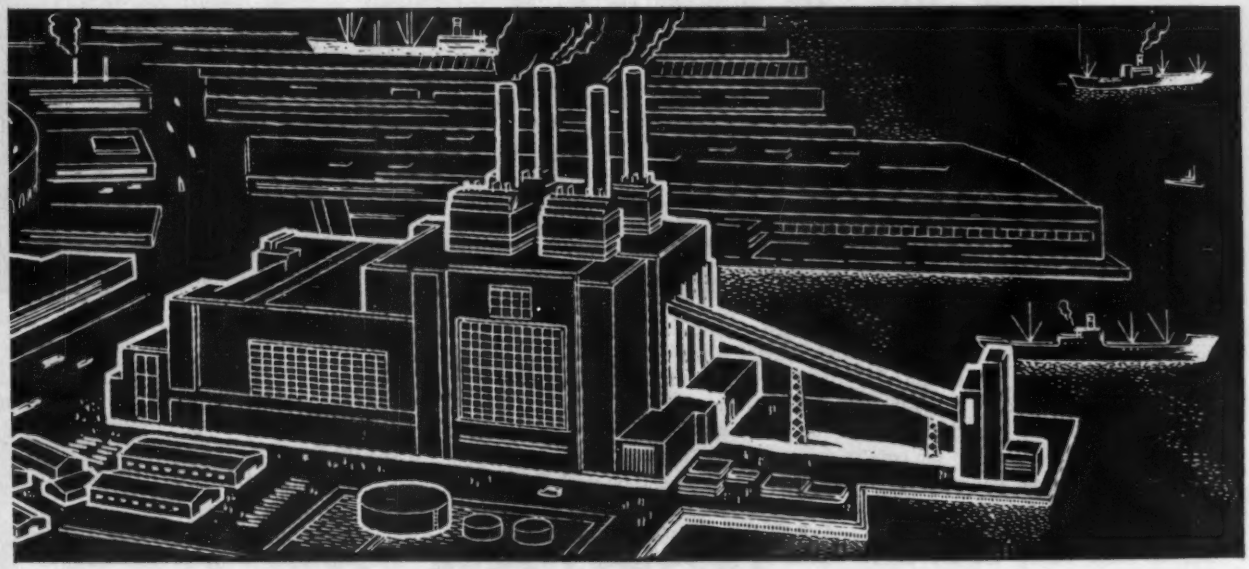


Now from I-T-E one million kva

15 kv metal-clad switchgear

Enjoy all the safety, compactness, negligible maintenance, and economy of air magnetic circuit breakers even up in this new high range. You can do it now. Quality I-T-E metal-clad switchgear is available in million kva, 1200 and 3000 amp ratings for 1958 delivery. The first installation is scheduled for the new substation of a large Eastern power company. Other orders are being taken now. Write for complete technical information on your specific application. Switchgear Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

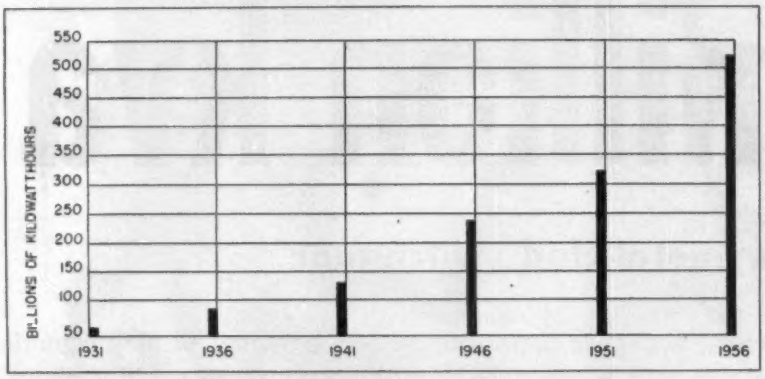
I-T-E CIRCUIT BREAKER COMPANY
SWITCHGEAR DIVISION



ADVERTISEMENT

USS COR-TEN Steel Hardware important to expanding utility facilities

- **COR-TEN Galvanized Hardware lasts life of treated pole**
- **Extended service results from excellent corrosion resistance and higher yield point**



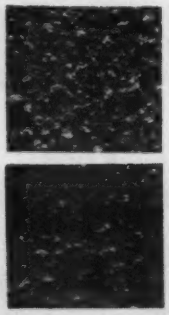
Annual sales of electricity by all utilities, both public and private, to ultimate consumers over the past twenty years. Figures are in billions of kilowatt hours.

Electrical consumption, both industrial and public, has been moving upward in strides that resemble the pace of a giant in seven-league boots. Atomically generated electricity is a reality. New and expanded generating facilities are coming into use all over the country. The eye-bugging *500-billion kilowatt hours* of electricity sold in 1956 looks like a figure reserved for astronomical tabulation. The telephone industry, too, is enjoying phenomenal growth—with new installations running at a rate of 2,000,000 units a year. The growth of these two industries calls for a great deal of transmission-line expansion.

New Lines

In establishing new lines, one important step can be taken that will cut future pole-line maintenance to the bone. That step is the specification of galvanized USS COR-TEN Steel Pole Line Hardware. That's because COR-TEN Steel's excellent resistance to atmospheric corrosion and its greater strength make it an ideal material for pole line application. In a direct comparison with plain carbon steel, COR-TEN Steel shows a *50% higher* yield point plus a resistance to atmospheric corrosion that is *four to six times* that of carbon steel. Here's how this translates into terms of service: in the corrosive atmosphere of industrial and marine areas, plain carbon steel hardware usually must be replaced at least once or twice during the life of a treated pole. Hardware made from COR-TEN Steel, on the other hand, is strong enough and corrosion-resistant enough to withstand the ravages of these atmospheres *for the full life of a treated pole!*

Why It Lasts


Carbon Steel
(1.5 years)
Actual photograph of initial coating of rust on uncoated samples of steel.
USS Cor-Ten Steel
(1.5 years)

The corrosion rate of galvanized COR-TEN Steel Pole Line Hardware and galvanized carbon steel pole line hardware is found to be about equal until the iron-zinc alloy layer becomes exposed through oxidation of the protective zinc coating or through breaks in the surface due to scratches caused by handling. When these conditions prevail, it is then that the true value of COR-TEN Steel becomes evident. The rate of corrosion of the iron-zinc alloy layer on COR-TEN Steel is considerably lower than on the carbon steel. Further, when the bare metals are exposed, COR-TEN Steel forms a smooth, tightly adhering oxide coating that keeps moisture from penetrating, thus slowing down further corrosion (see cut); while the loose, flaky scale on carbon steel (see cut) drops off, allowing further corrosion to take place.

Higher Yield Point

Once deterioration of a steel sets in, the matter of exactly how long it can remain in service depends a great deal on the steel's yield point. This is particularly true of thinner gage hardware such as straps. Here again, COR-TEN Steel stands pole and cross arms above carbon steel. In thicknesses of ½ inch and less, USS COR-TEN Steel has a minimum yield point of 50,000 psi. This means that even when a piece of COR-TEN Steel Hardware corrodes to the point where a unit of carbon steel would have to be replaced, the COR-TEN Steel Hardware is still capable of many more years' active service on your pole. For example—in an industrial atmosphere, an uncoated ⅝-inch COR-TEN Steel bolt can be expected to have a service life of 35.7 years—*five times the life of a carbon steel bolt the same size!*

Simultaneous Replacement

Certainly the most economical method of establishing and maintaining utility lines is to be able to erect a new, pressure-creosoted pole and its hardware and have them both remain in service for an equal time. The savings enjoyed are obvious — no maintenance-crew-time for replacement, no further investment in hardware, no interrupted service, less wear and tear on equipment. That's why serious consideration of USS COR-TEN Steel is so important to your future maintenance costs.

Although United States Steel does not manufacture pole line hardware, it is the major producer of COR-TEN High-Strength Low-Alloy Steel. We will gladly send you the names of companies manufacturing pole line hardware from USS COR-TEN Steel. To help you in making your decision, you'll find a great deal of pertinent information on low-cost, high-strength, corrosion-resistant hardware in our book, "USS COR-TEN Steel Pole Line Hardware." Just write to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

"USS" and "Cor-Ten" are registered trademarks.

Proven Leadership*

*IN 1956 . . . MORE UTILITIES BOUGHT

POWERS American

SERVICE BODIES

THAN ANY OTHER MAKE

HERE'S WHY! Powers-American builds *fine* service bodies . . . and *builds them to last.*

Powers-American can furnish the *just right* body for any service job—standardized for greatest economy . . . modified-standard, to fit individual job needs . . . custom-made, to meet specific operating requirements.

Whether you have one truck or the largest fleet . . . you'll find it worthwhile to get details from Powers-American next time you need service bodies for your operation.

SERIES 350 Bodies have an under-floor winch, a fold-over derrick, and an extension ladder. Compartments are equipped to carry a variety of service tools, parts, and materials.

SERIES 25 Bodies are available in standard models equipped specifically for telephone, electric, gas, or water meter installation and service.

SERIES 44L Bodies have same construction features as Series 44 Bodies described above . . . plus a shelf-equipped superstructure, available with or without roof.

SERIES 450 Bodies, designed for light duty construction and maintenance work, are equipped with a revolving aerial ladder, an underfloor winch, and an easy-to-use derrick.

SERIES 44 Bodies . . . in 75", 90", and 104" lengths . . . are designed for service work in any phase of the utility industry. Equipped with bins, racks, material hooks, and adjustable shelves. Available with optional items to fit individual work needs.

Descriptive literature and price information is yours for the asking

UTILITIES EXPECT MORE FROM POWERS American

McCABE-POWERS

AUTO BODY COMPANY

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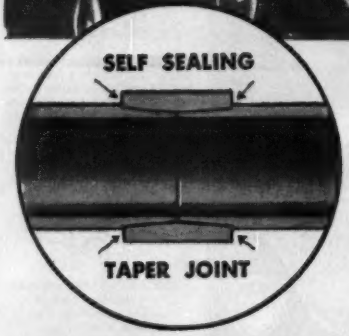
WATERTIGHT!



Orangeburg Fibre Conduit Prolongs Cable Life

Keep out corrosive ground waters, and you prolong the life of underground cables, say utility engineers!

Why? Because ground waters containing corrosive elements derived from the soil and concrete encasement attack cable sheath and shorten cable life. Orangeburg's impermeable wall and self-sealing Taper-Sleeve Joint shed them *"like water off a duck's back."* You get maximum protection with Orangeburg.

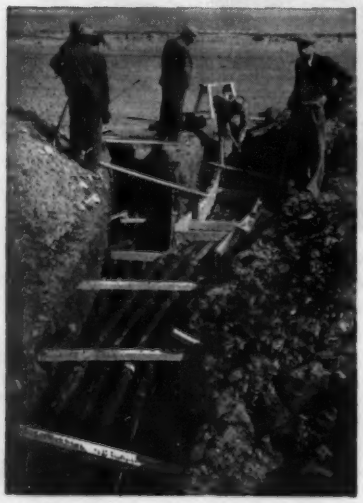
Orangeburg protects cables in many other ways. Smooth bore, low co-efficient of friction reduce incidence of abrasion. Its material is strong, tough, resilient, durable.

No other conduit is easier to install

Light, 8-foot lengths and a complete line of bends and fittings speed installation. Taper-Sleeve Joints tap water-tight in a jiffy. Orangeburg lays faster and at lower cost than any other type of conduit.

Orangeburg Fibre Conduit has prolonged cable life at minimum expense for utilities, municipalities and industry since 1893.

Distributed by Graybar Electric Company and by General Electric Supply Company. Branches and stocks in principal cities.



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ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

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LCU-10 SERIES

ANDERSON ELECTRIC

Performance at Point-of-Contact is what counts! Anderson Electric's new U-bolt aluminum parallel groove connector with COVER ALL spacer . . . maintains cable configuration . . . speeds installation . . . provides more area contact . . . increases range . . . increases pull-out strength . . . assures inhibitor protection.

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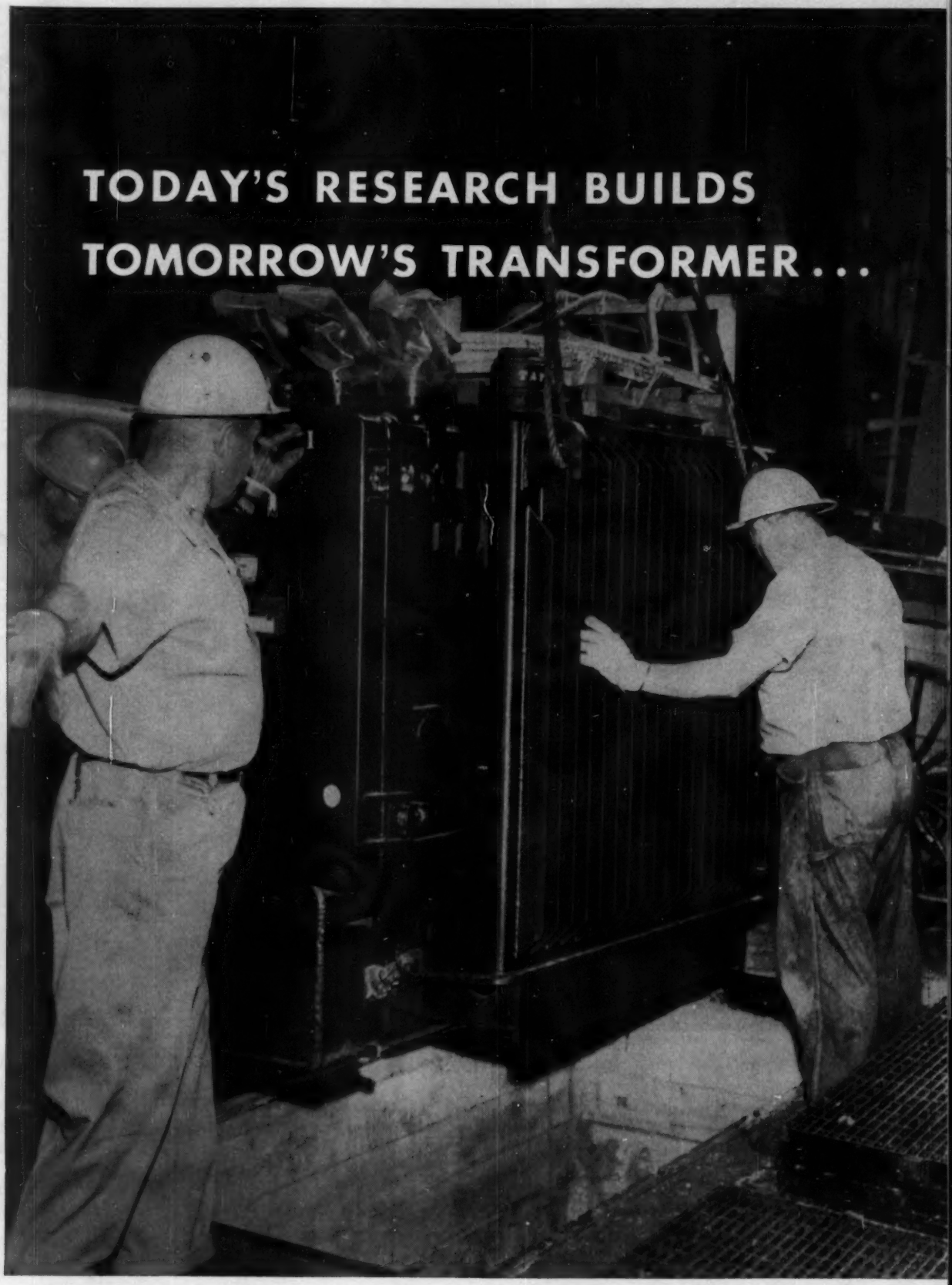
P.O. Drawer 2151, Birmingham 1, Ala.

Aluminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATIONS • TRANSMISSION • DISTRIBUTION


TODAY'S RESEARCH BUILDS
TOMORROW'S TRANSFORMER . . .

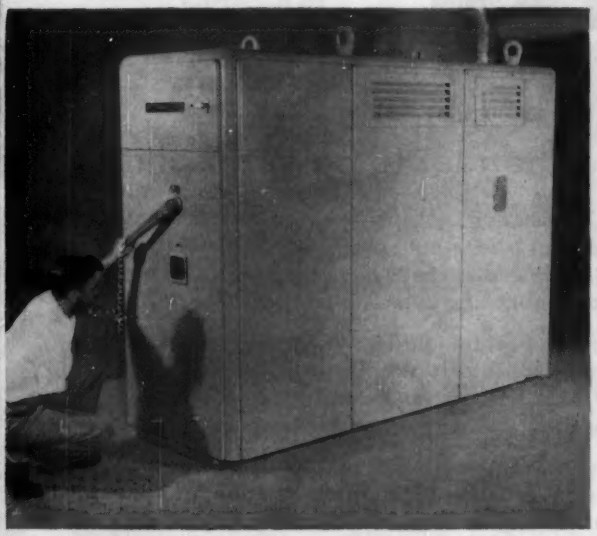
WORLD'S FIRST IN COMMERCIAL SERVICE, NEW WESTINGHOUSE TRANSFORMER COOLED BY HIGH-DIELECTRIC STRENGTH GAS

In July, 1957, the world's first and only commercial installation of a vapor-cooled transformer utilizing high-dielectric strength gas went into service. This unit, operating on the network system of the Consolidated Edison Company of New York, is another product of continuing research and development at Westinghouse.

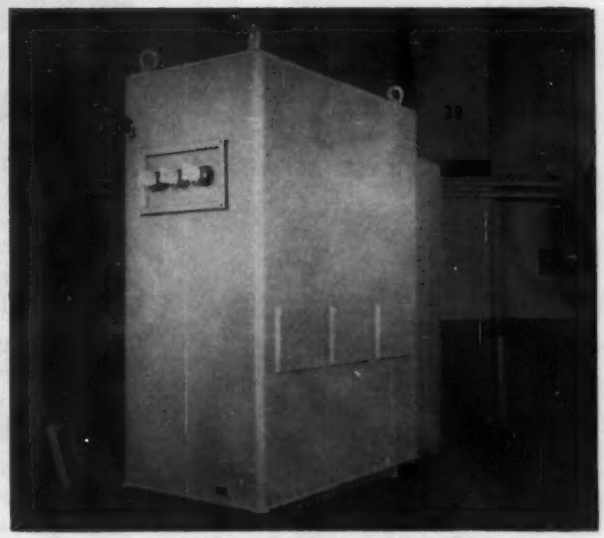
Announced first by Westinghouse in 1951, vapor cooling is another long stride toward the transformer of the future. Now larger, higher voltage transformers are in design and construction, utilizing the knowledge and experience gained from the development of this unit. These larger transformers will make full use of the advantages of vapor cooling.

The Westinghouse principle of vapor cooling is one more in a long line of developments resulting from plowing back earnings into research . . . another example of Westinghouse co-operating with the utility industry to help keep electricity America's biggest bargain. J-70831

YOU CAN BE SURE...IF IT'S Westinghouse

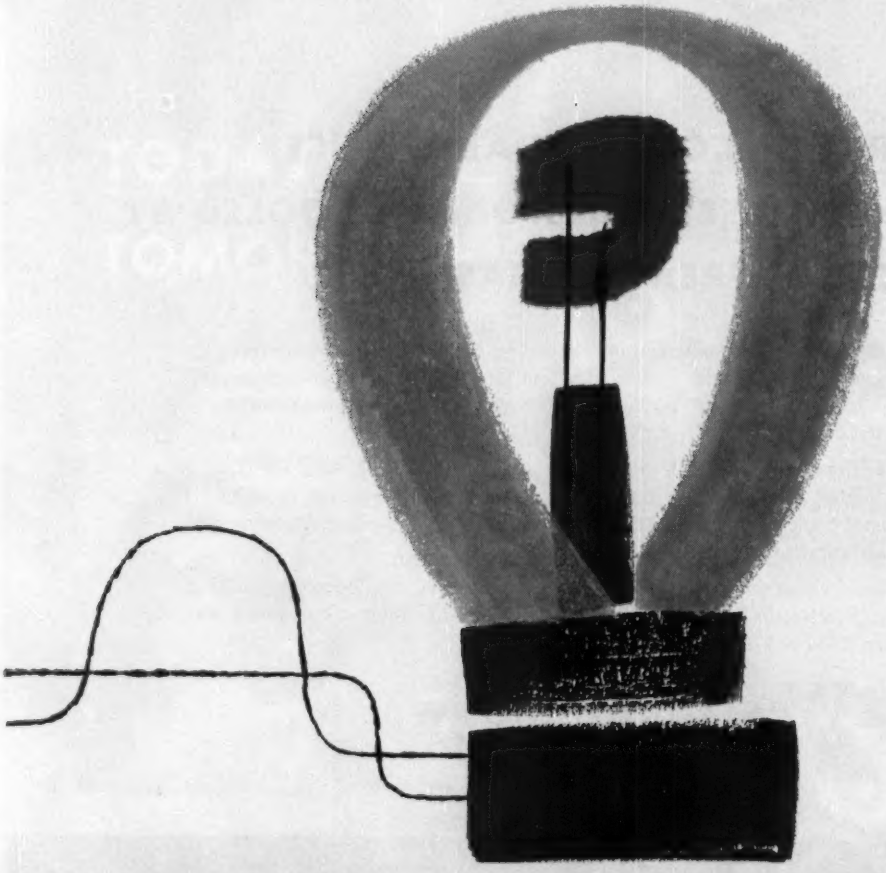


The ventilated dry-type transformer, which is the heart of this integral substation, was introduced first by Westinghouse 20 years ago.



The sealed dry-type transformer shown here is another Westinghouse first . . . now has 15 years' proven experience behind it.

call KE for plant expansion or new facilities



INGENUITY

has made KE a major builder of dependable power facilities

100,000 kw steam power plant now under construction at Josephtown, Penn., for St. Joseph Lead Company, a large American lead and zinc producer. The new turbo-generator plant is being designed and built by KE's thermal power plant specialists.

Since installation, no unscheduled outages have occurred in power plants built by Kaiser Engineers. On the contrary, in numerous cases KE-built plants have fed power into neighboring systems temporarily "down."

Preventing outages, building in reliability that insures against service interruption—these are benefits of engineering and construction ingenuity as surely as are low initial cost, fast completion, and low operating cost.

Experienced KE engineers can take your power plant idea from conversation through completion; conduct every phase from economic analysis through operator training. Whether your future power needs are thermal or nuclear, call KE.

KAISER ENGINEERS engineers—contractors
Contracting since 1914

Division of Henry J. Kaiser Company • Oakland 12, California • New York, Pittsburgh, Washington, D.C., Buenos Aires, Calcutta, Dusseldorf, Montreal, Sydney, Tokyo

4584

unblemished safety record

For more than 40 years, Cochrane Multiport Relief Valves have served industry with a spotless record of unfailing operation.

Not once in all these years have these valves failed to open to atmosphere to protect personnel and valuable equipment against too high pressures!

Reason for this remarkable record is their unique design. Unlike ordinary relief valves, Cochrane Multiport Relief Valves automatically e-a-s-e open under excess, undesired back pressure and bleed off only the exact unusable quantity that caused the overpressure, and then gently and tightly close—without blow-down, back surge or vapor hammer!

Cochrane Multiport Relief Valves are made of various materials to satisfy maximum operating and corrosion conditions. They function equally well whether designed for saturated or superheated steam, air or gas. Their corrosion resistant, "vapor cushion" valve discs will not rust, freeze, or stick.

For complete details write for Publication 5200.

NOTE: *Cochrane Multiport Relief Valves are adaptable to check, spillover and other services.*

COCHRANE CORPORATION WATER CONDITIONING ENGINEERS SINCE 1863 PHILADELPHIA

Cochrane

CORPORATION

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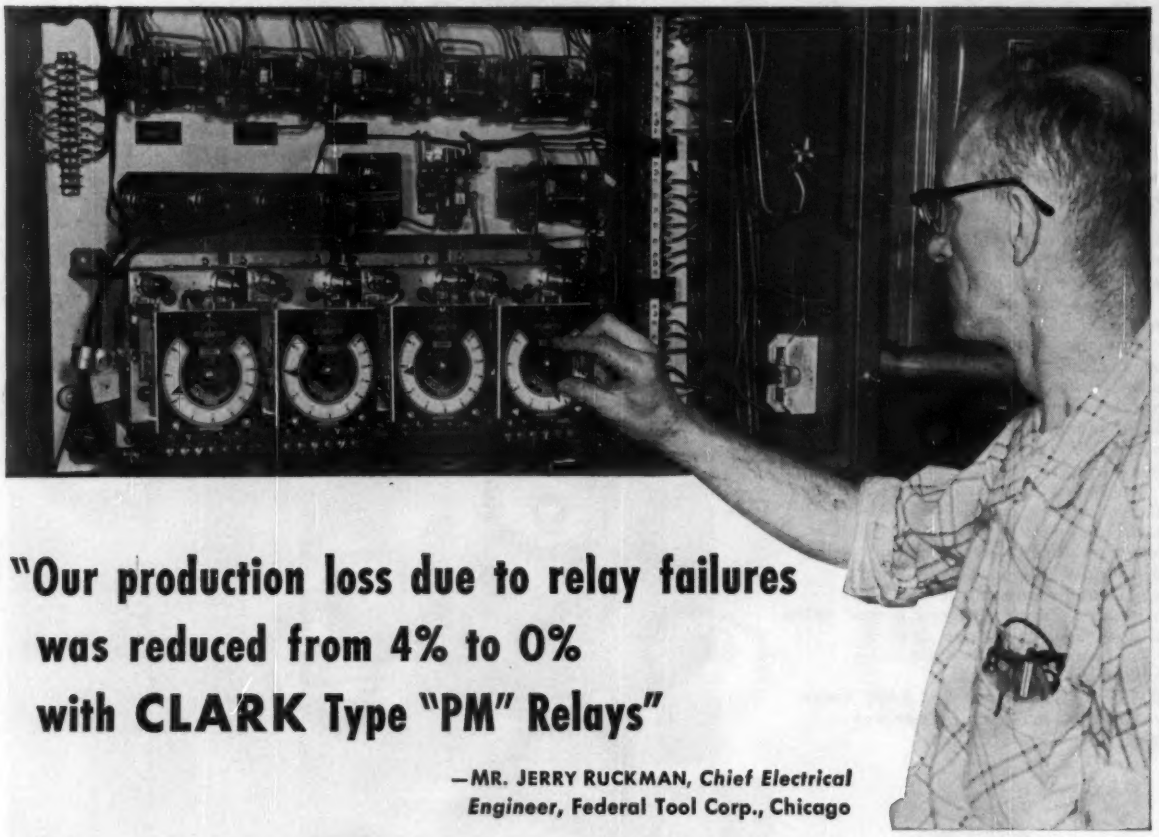
Cochrane Water Conditioning Ltd., Toronto 4; Montreal 1, Canada

Representatives in 30 principal cities in U.S.; Paris, France; La Spezia, Italy; Mexico City, Mexico; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii; Manila, Philippine Islands.

Pottstown Metal Prods. Div.—Custom built carbon steel and alloy products.

Demineralizers • Zeolite Softeners • Hot Process Softeners • Hot Lime Zeolite Softeners • Dealkalizers • Reactors
Deaerators • Pressure Filters • Continuous Blowoff Systems • Condensate Return Systems • Steam Specialties



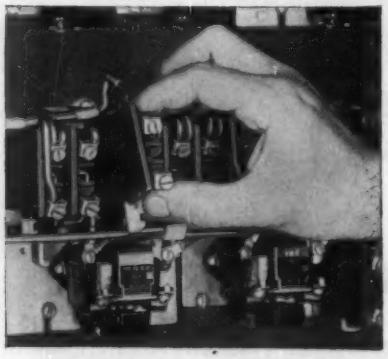
"Our production loss due to relay failures was reduced from 4% to 0% with CLARK Type "PM" Relays"

—MR. JERRY RUCKMAN, *Chief Electrical Engineer*, Federal Tool Corp., Chicago

Explains Chief Engineer Ruckman: "We turn out plastic housewares, haircurlers, toys, premiums and other plastic products by the hundreds of thousands every twenty-four hours. Demand is high. Customers insist on prompt delivery. That's why we were so concerned over the erratic operation of the relays in our molding machine control panels—the heart of our production line.

"We found that non-conductive plastic dust was collecting on the relay contacts, causing them to fail. When this happened, production was halted. Losses amounted to four percent.

"Two years ago we installed Clark Type PM relays, in which each set of contacts is shielded by its own melamine housing. Production stoppages from plastic dust have been cut to zero."



The unique sectional pole construction of the Clark Type "PM" relay offers many other important advantages

Compact, it's a space-saver. Rugged, it has built-in protection against vibration damage. Simple, it is easy to install and service. Each pole is a self-contained unit that can be removed, installed or replaced without disturbing the others. All terminals are in front for easy accessibility. Each pole has its own individual arcing chamber—a short circuit through one set of contacts is confined to a single pole, and will not destroy the entire relay.

The **CLARK CONTROLLER** *Company*

Everything Under Control 1146 East 152nd Street • • Cleveland 10, Ohio

IN CANADA: CANADIAN CONTROLLERS, LIMITED • MAIN OFFICES AND PLANT, TORONTO

JUST OUT!

All-new '58

DODGE *PowerGiants*

4-WAY LEADERS OF THE LOW-PRICED 3

Now—for the first time in truck history—one make leads the low-priced three *all four ways!* And that make is DODGE—all new for 1958!

From the future comes Dodge styling — handsome, sweeping, prestige-winning lines, richly trimmed in sparkling chrome.

From 40 years of truck experience comes remarkable engineering advances . . . outstanding performance, load capacities and economy.

See these great new trucks soon. And be *sure* to get your Dodge dealer's special 40th-anniversary deal before you buy any other make!

1 **FIRST IN PAYLOAD!** Advanced construction gives extra strength *without* extra weight, lets you haul up to ⅓ more, cut down on trips.

2 **FIRST IN POWER!** New 204- to 234-hp. *Power Giant* V-8's! Extra power cuts trip time, lets you pass more safely, reduces engine strain.

3 **FIRST IN ECONOMY!** Most advanced of all V-8 truck engines. Exclusive Power-Dome combustion increases gas mileage, cuts upkeep costs.

4 **FIRST IN STYLING!** All-new design! Deluxe chrome grille and trim . . . modern dual headlights . . . future-inspired lines . . . smart new colors.

TURN PAGE FOR FULL-LINE STORY →

There's a

'58 DODGE *PowerGiant*

for every job . . . for every business . . . for every pocketbook

Low-tonnage models

Pick-up
model 100

Town Panel
model 100

Town Wagon
model 100

Forward-Control
model P300

Medium-tonnage models

Model 400
Van Body

Model 500—Stake

Four-Wheel-Drive
W500
Chassis

Model 600
Tractor

Heavy-duty models

C.O.E. model 700

Model 900—
Tractor

Model T800—
Mixer Body

Model T900—
Dump Body

CONDENSED SPECIFICATIONS

CONVENTIONAL MODELS
G.V.W. Range
4,250 lbs. to 9,000 lbs.
Engines
120-hp. 6-cylinder
204-hp. V-8

4-WHEEL-DRIVE MODELS
G.V.W. Range
5,100 lbs. to 10,000 lbs.
Engines
113- 120- 125-hp. 6-cyl.
204-hp. V-8
204-hp. V-8 (Heavy-Duty)

FORWARD-CONTROL MODELS
G.V.W. Range
6,000 lbs. to 9,000 lbs.
Engines
120-hp. 6-cylinder
204-hp. V-8

CONVENTIONAL MODELS
G.V.W. Range—11,000 lbs. to 22,000 lbs.
Engines—125- 130- 141-hp. 6-cyl.
204- (H.D.) 207-hp. V-8's

C.O.E. MODELS
G.V.W. Range—15,000 lbs. to 22,000 lbs.
Engines—204- (H.D.) 207- 218-hp. V-8's

4-WHEEL-DRIVE MODELS
G.V.W. Range—15,000 lbs. to 20,000 lbs.
Engines—130-hp. 6-cylinder
204- (H.D.) 207-hp. V-8's

SCHOOL BUS MODELS
G.V.W. Range—10,500 lbs. to 22,000 lbs.
Engines—125- 130- 141-hp. 6-cyls.
204- (H.D.) 207-hp. V-8's

FORWARD-CONTROL MODELS
G.V.W. Range—7,500 lbs. to 15,000 lbs.
Engines—120-hp. 6-cylinder
204-hp. V-8

CONVENTIONAL MODELS
G.V.W. Range
18,500 lbs. to 30,000 lbs.
Engines
218- 224- 234-hp. V-8's

C.O.E. MODELS
G.V.W. Range
18,500 lbs. to 25,000 lbs.
Engines
218-hp. V-8

TANDEM MODELS
G.V.W. Range
26,000 lbs. to 46,000 lbs.
Engines
218- 224- 234-hp. V-8's

SCHOOL BUS MODELS
G.V.W. Range
17,500 to 23,000 lbs.
Engines
218-hp. V-8

Savannah Electric and Power Reports:

TROUBLE-FREE COMMUNICATIONS FOR FOUR YEARS WITH GENERAL ELECTRIC TWO-WAY RADIO

For the past four years, the Savannah Electric and Power Company has depended upon trouble-free G-E two-way radio to coordinate maintenance, transmission, and construction crews throughout a five-county, fifty-mile city radius.

General P. E. Seawright, Superintendent of Transmission and Distribution for Savannah Electric and Power, reports his organization has never experienced a serious break in two-way radio communications, during four years of operation. He credits General Electric's dependable equipment, teamed with a maintenance program provided by the local General Electric Authorized Service Station, for assuring his firm of full 24-hour radio services.

Radio Cuts Service Loss Time

Seventeen mobile units in the fleet of service and supervisory vehicles are coordinated by radio from the office of General Seawright, in the Savannah office.

General Seawright credits the G-E two-way radio system for speedy assists in the restoration of service in emergencies. This is a vital factor to the thousands of homes and commercial installations over 1000 miles of line.

New Progress Line Radio

General Electric's new Progress Line radio provides full chassis, interchangeability, plug-in chassis, and new 6600 series tubes, specially designed and tested for radio communication circuits.

Your Communications Counselor can give you full details. Call him in, or, write: *General Electric Co., Communication Products Dept. 911-57, Electronics Park, Syracuse, N. Y.* In Canada, write: *C.G.E. Electronics, 830 Lansdowne Avenue, Toronto.*

Progress Is Our Most Important Product

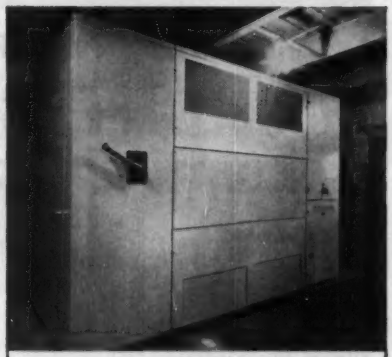
GENERAL ELECTRIC

Nation's most modern air terminal served by power from Wagner Transformers!

The "Spirit of St. Louis" is reborn in the city's newest symbol of the air age—the dramatic new terminal at Lambert-St. Louis Municipal Airport. Built at a cost of $7,728,000 and dedicated in 1956, it's the most modern in the nation.

Electric power for this terminal is distributed by five secondary unit substations, rated from 300 to 1500 kva. These were manufactured by Nelson Electric Company and equipped with safe, dependable Wagner dry-type Transformers. Wagner dry-type Transformers are carefully engineered to provide an uninterrupted flow of power—built to stand up under rigorous 24 hours a day schedules. Wagner pioneered in the development of dry-type load center transformers, and the Wagner design is known for its great electrical stamina and mechanical strength.

Wagner dry-type unit substation transformers can answer your power needs just as they do at Lambert-St. Louis Municipal Airport. They are "Predesigned"—coordinated with the specifications of unit substation builders to save you job engineering, time, and cost. Consult the nearest of our 32 branch offices, or write for Bulletins TU-205 and TU-214 for full information.



This is the Nelson main substation at the St. Louis Airport. It is equipped with a 1500 kva Wagner Dry-Type Transformer.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

...to help America LIVE BETTER—*Electrically*

LIVE BETTER ELECTRICALLY

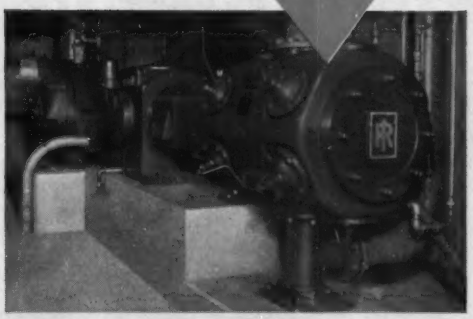
Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

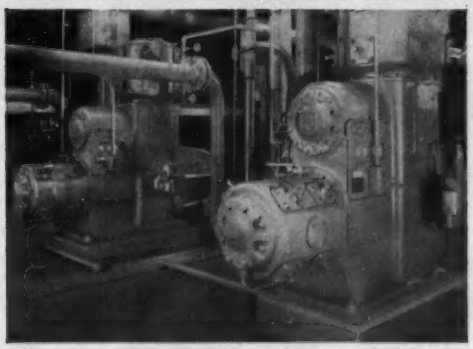
WT57-9

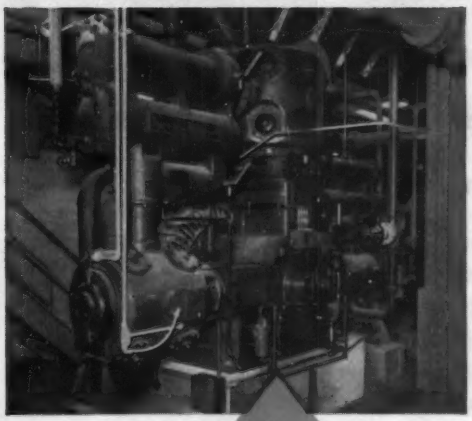
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

THE RIGHT COMPRESSOR

for EVERY Power Plant application







Compressors designed
FOR THE JOB operate
most dependably and economically

for INSTRUMENT AIR
ESH-NL Compressors 20 to 150 hp

Ingersoll-Rand heavy-duty Class ESH compressors with NL (non-lubricated) cylinders meet the most exacting instrument-air requirements—dependability, continuity of service and *oil-free air*. The NL piston is fitted with graphitic-carbon supporting and pressure rings, requiring no oil, grease, water or glycerine for lubrication.

for GENERAL SERVICE AIR
XLE Compressors 125 to 350 hp

The XLE is a two-stage, electric-driven, heavy-duty compressor. The proven design, using full-floating aluminum bearings, and thru-frame air flow with packaged intercooler, makes the XLE a logical choice wherever a dependable supply of service air is required. Maintenance and operating costs are low. The machines are easy to install, requiring only a minimum of foundation because of their excellent running balance.

for SOOT BLOWING
TVH Compressors 200 to 450 hp

These three-stage compressors have been specifically developed for heavy-duty soot-blowing service at pressures from 350 to 500 psi. Inverted "T" design, with self-contained intercooling assures high overall efficiency, low discharge temperatures and smooth running balance.

Only I-R Compressors

have CHANNEL VALVES

I-R Channel Valves are known the world over for their high efficiency, remarkable durability, long service life and freedom from maintenance. On opening, the valve channel lifts upward against spring pressure—trapping a cushion of air between the channel and spring. This exclusive air-cushioned design cuts impact shocks, reduces wear and assures quiet operation.

NL Channel Valves for non-lubricated cylinders are the only valves designed specifically for this service, with no metal-to-metal sliding or rubbing surfaces, assuring sustained high efficiency and longer valve life.

For a quick solution
to any compressor problem,
call your I-R representative

Ingersoll-Rand

I-693

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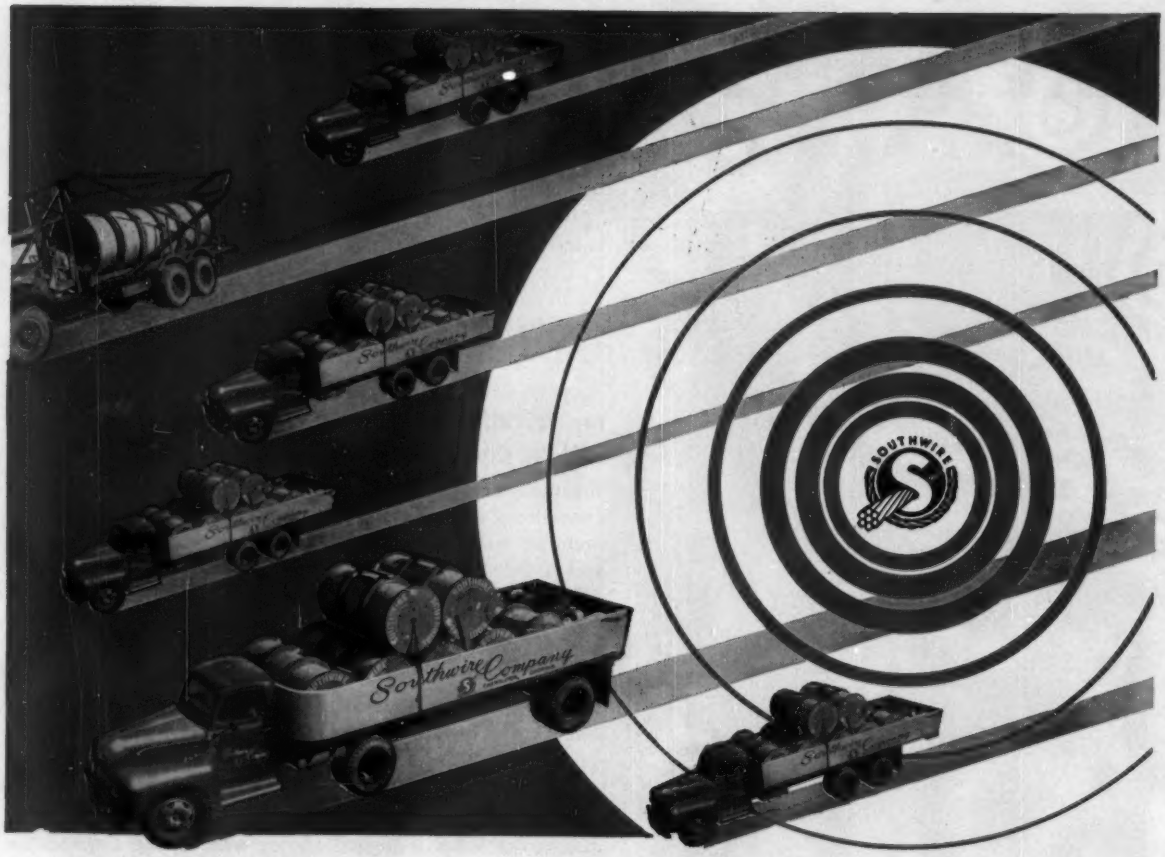
COMPRESSORS • CONDENSERS • AIR AND ELECTRIC TOOLS • TURBO-BLOWERS • PUMPS • ROCK DRILLS • GAS AND DIESEL ENGINES



Southwire Trucks Make 1089 Trips and Cover 2 Million Miles a Year

To provide service on a par with Southwire quality

We learned a long time ago that, in this business, to win customers and keep them, service must be on a par with the quality of products. That's why Southwire operates its own fleet of modern trucks over a vast network—from Minnesota to Florida, from Pennsylvania to Texas. It is your positive assurance of dependable deliveries—direct to your warehouse or job site.

Southwire products are produced in our own modern plant to meet the most exacting requirements and specifications. Their quality is controlled from start to finish, checked and re-checked every step of the way, to give you the best.

Next time order Southwire products and get Southwire service automatically.

SOUTHWIRE serves the world

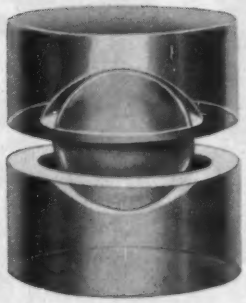
Southwire® Company

TErrace 2-6311 CARROLLTON, GEORGIA

with these quality products:

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP* (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

Guaranteed for life!



All Sangamo Watthour Meters—singlephase and polyphase—have lifetime guarantee on materials, workmanship, and bearing system

The ball and jewel bearing system used for years in Sangamo Watthour Meters has been test-proven to withstand 800 million revolutions without appreciable wear. But Sangamo research has now determined that treating the cobenium ball bearing with Molykote® Microsize (the most highly purified molybdenum disulphide) will give such optimum performance that *the bearing system will never need relubrication, inspection or replacement!*

That's why Sangamo now offers an unprecedented lifetime guarantee —covering materials, workmanship, and bearing systems on all Sangamo Meters using the cobenium ball and sapphire jewel bearing system, made after October 1, 1957.

P.S. Ask your Sangamo Representative how you can use this discovery to add to the useful life of your existing meter bearing systems.

JM57-8

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

Tie it . . . clamp it . . . the conductor carries the current, but the *porcelain* insulates it from ground. Lapp builds the Line Post with either type of conductor head for maximum convenience of installation . . . and it builds the *porcelain* to do the *insulating* job. The porcelain in either case is a closed-end post, of high density vacuum-process electrical porcelain. It won't puncture because it has no conductive material within it. It outperforms any other type of insulator in dirt conditions because its fog-type design prevents leakage flashover from non-uniform leakage resistance. It stands up under arcover, stones and bullets because its short, sturdy petticoats protect the body. And it won't crack because its hardware, both top and bottom, is *externally* attached, and can load porcelain only in compression.

With tie-wire or clamp-top, the Lapp Line Post will give you an *extra* margin of operating security, low upkeep, long life.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

NEW Holan derrick "stretches" to handle long poles

Lifts heavy loads in low ranges, body-loads 4,000 pounds, comes low enough to power-feed diggers

No conventional derrick, this one. It has an extendible boom head that "stretches" the derrick an extra five feet (to 28 feet high) for handling poles up to 75 feet long. Yet, with boom head extended, little lifting capacity is lost. In a position about 10 degrees off vertical, it lifts 8,000 pounds; with boom head extended, it still lifts 6,000 pounds.

Two sets of cylinders provide greater lifting capacity in low ranges. Auxiliary lift cylinders raise the derrick almost to vertical, then the main lift cylinders take over.

Three other important features: (1) You can body-load 4,000 pounds (2) You can bring the derrick low enough to use digger power feed attachments (3) You can operate more safely by checking the new easy-to-read load indicator which gives capacities at all derrick positions.

Like other Holan derricks, this one is made of high-tensile steel and fits any body on its own supports. It also has Holan's lighter-but-stronger fabricated side legs. We'd like to tell you more. Write and ask about the Holan Series 6800 Power Derrick with or without Extendible Boom Head.

All Holan bodies are made of hi-tensile, rust-resistant steel 20 to 25% lighter than ordinary steels.

Line construction bodies for light to heavy-duty. Crew compartments optional. Efficient tool compartments and drawers.

Service bodies for chassis up to 1½ ton. Lengths, 72", 84" and 102".

Aerial arm for spotting workmen 37 feet above ground, 9 feet below ground level. Double-basket unit extends 45 feet. Rotates 360°.

Ladders to 40' with all phases completely hydraulic. Pump actuated by P.T.O. or separate engine drive with electric starter.

Portable hydraulic and mechanical earth borers. Augers for 8" to 20" diameters, depth to 8'.

Hydraulic towers with rotary, stationary, or transverse platforms. Exclusive box-girder telescoping mast.

J.H. HOLAN® CORPORATION

4100 WEST 150TH STREET
CLEVELAND 11, OHIO

OTHER PLANTS:

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BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

PREFORMED ARMOR RODS
increase uninterrupted service life of conductor

The wind blows, the conductor vibrates and the life of your line is at stake. If the vibration problem is such that severe frequency and amplitude conditions are sufficiently prolonged, the conductor could begin to break regardless of the protective armor used. And, if the conductor begins to break, PLP Preformed Armor Rods have a big advantage over other armor: The rods undertake the function of an electrical and mechanical repair splice.

All armor rods greatly reduce vibration stresses, but if vibration is severe enough to cause strand breaks, other types will not prevent parting of the strands. With PLP (short pitch) Preformed Armor Rods, it's a different story; the conductor is held tightly and uniformly throughout the entire length of the rods—not at one point. You have a long, firm grip that never relaxes, that maintains conductivity in spite of the break. Thus, your line continues to function unimpaired.

There is one other Preformed advantage to keep in mind. Some types of armor require the use of bolted end-clamps that can shake loose and cause chafing. Preformed Armor Rods require no end-clamps.

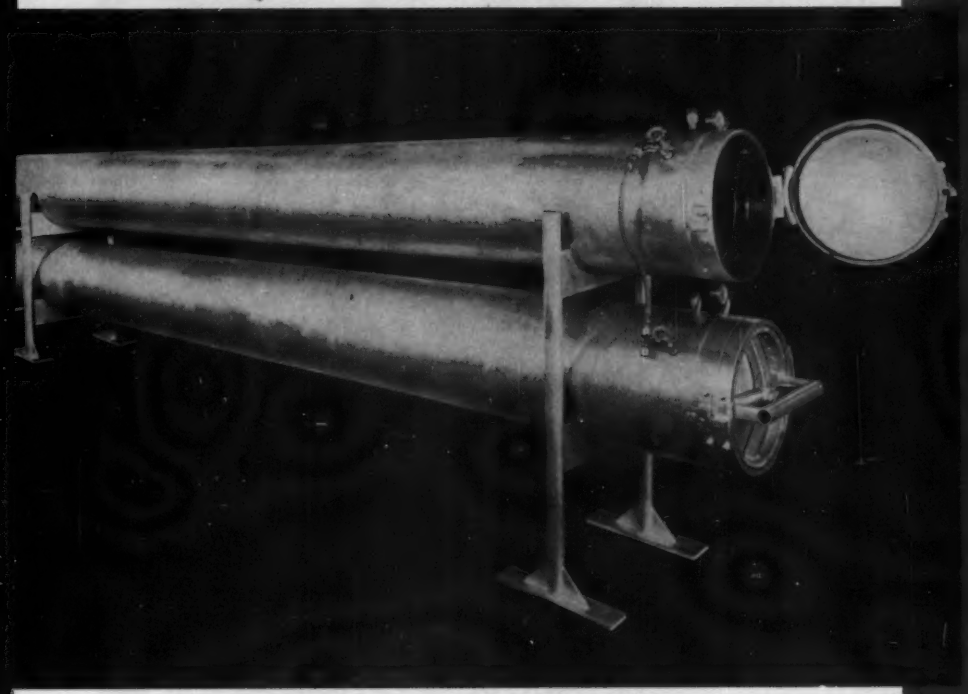
For a long uninterrupted service life, Preformed Armor Rods are the best suit of armor your conductor can wear. PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland . . . in 10 years the leading manufacturer of armor rods, dead-ends, Guy-Grip dead-ends and other line accessories.

PLP

You can look up to **Preformed**

Made in accordance with or licensed under U. S. Patent Nos. 2,609,653; 2,775,019 and 2,587,521. Other patents pending.

PURGE HYDROGEN-COOLED GENERATORS



WITH DRY ICE FORM OF CO_2 GAS

Dry Ice Converters Are The Most Convenient, Economical Source for Carbon Dioxide . . .

- **USED BY LARGEST ELECTRIC POWER COMPANIES IN THE UNITED STATES**
- **ELIMINATE HAZARDS OF MOVING GAS CYLINDERS IN AND OUT OF PLANT**
- **OFFERS LARGE STORAGE CAPACITY AT ANY CONVENIENT LOCATION INSIDE OR OUTDOORS**
- **UP TO 75% SAVING OVER COST OF GAS FROM CYLINDERS**

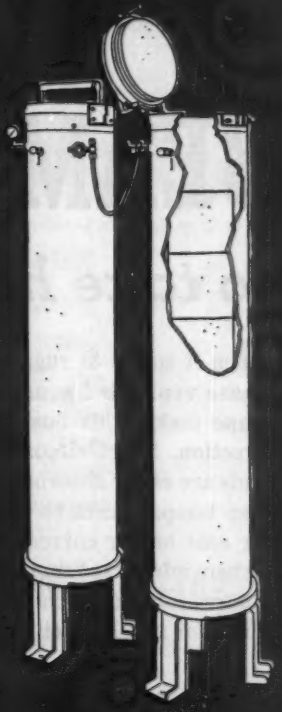
Dry Ice Converters are ASME-designed pressure vessels which are charged with standard-sized fifty pound blocks of solid CO_2 which sublime to gas and remain contained until needed. No refrigeration, power or attention is required. They are available up to 1000 pounds capacity (equivalent to 8700 cubic feet) and may be manifolded together by piping if greater volume is required.

Installations can be made vertically or horizontally any place that is convenient to plant layout, and with pressure regulator at converters, can be connected by low-pressure piping to locations of use. Thus the installation is permanent, and the hazard of handling high-pressure gas cylinders in your plant is eliminated.

Already in use in the largest electric power companies in the U.S.A., Dry Ice Converters have proved their worth by being re-ordered for use with added facilities. Plant executives have found that: besides the convenience and safety advantages offered by Dry Ice Converters, they can save up to 75% on CO_2 cost because dry ice in commercial quantities offers such a substantial price advantage over cylinder gas.

●

For further information on the applications of Dry Ice Converters to electric power company use, write or wire.



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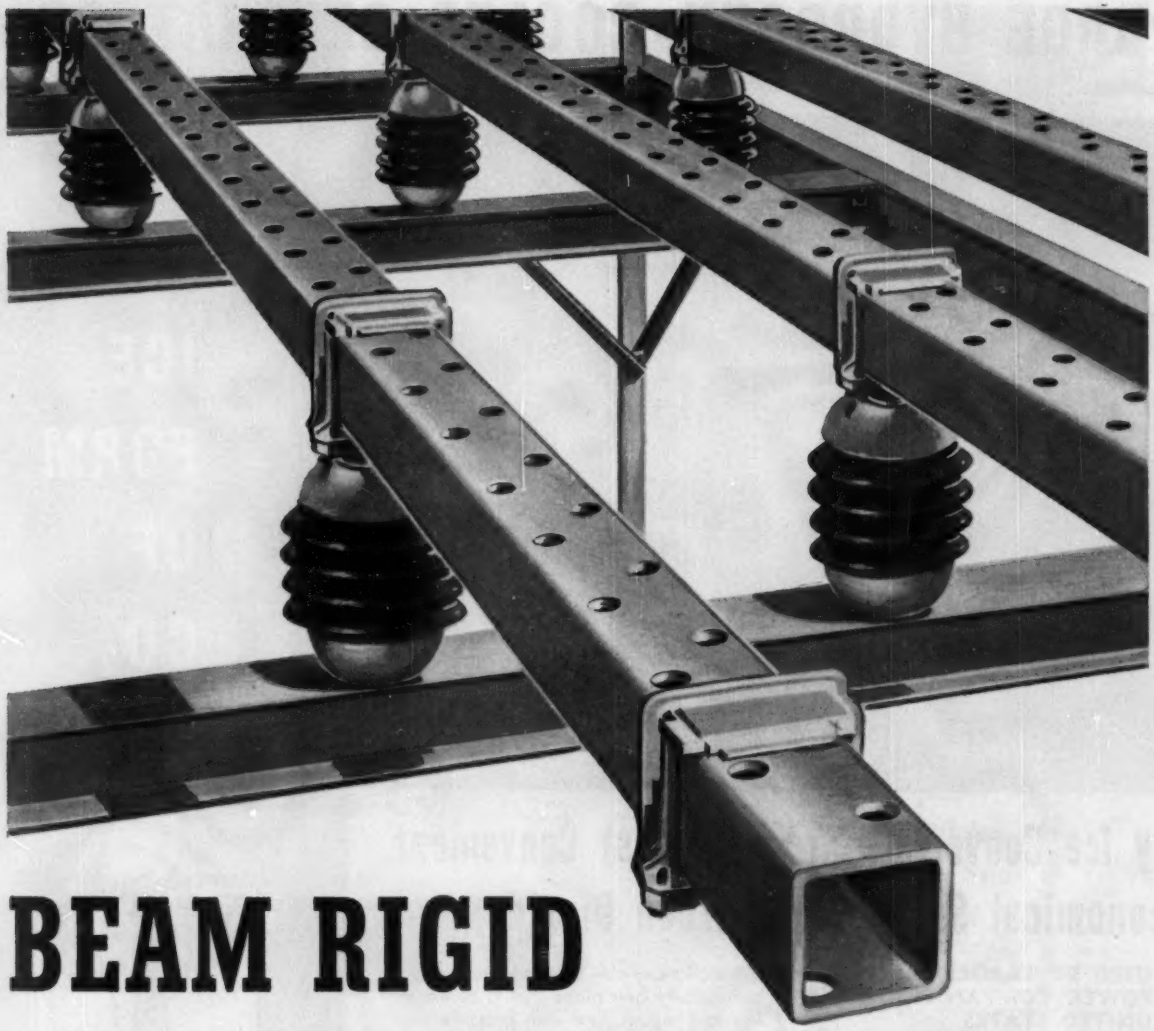

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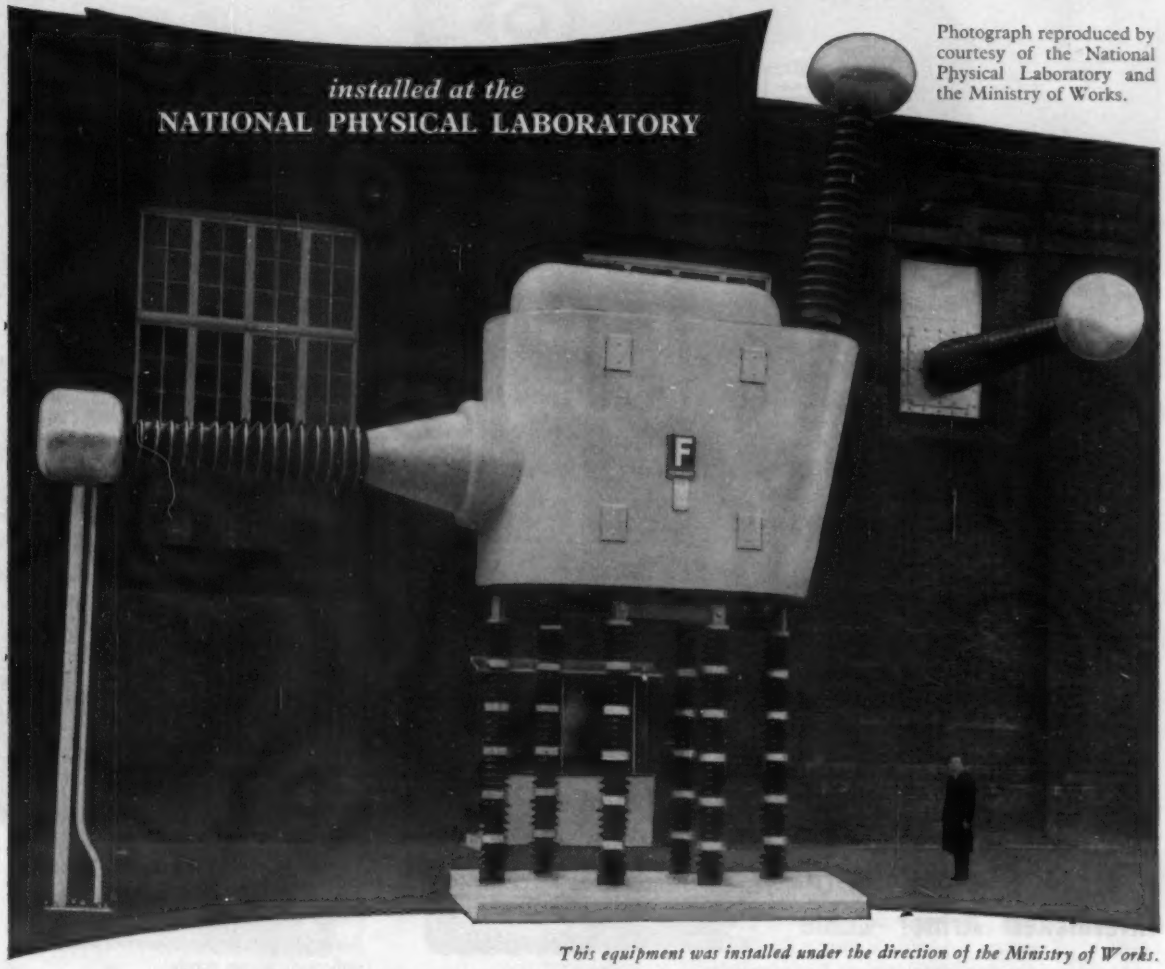

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This equipment was installed under the direction of the Ministry of Works.

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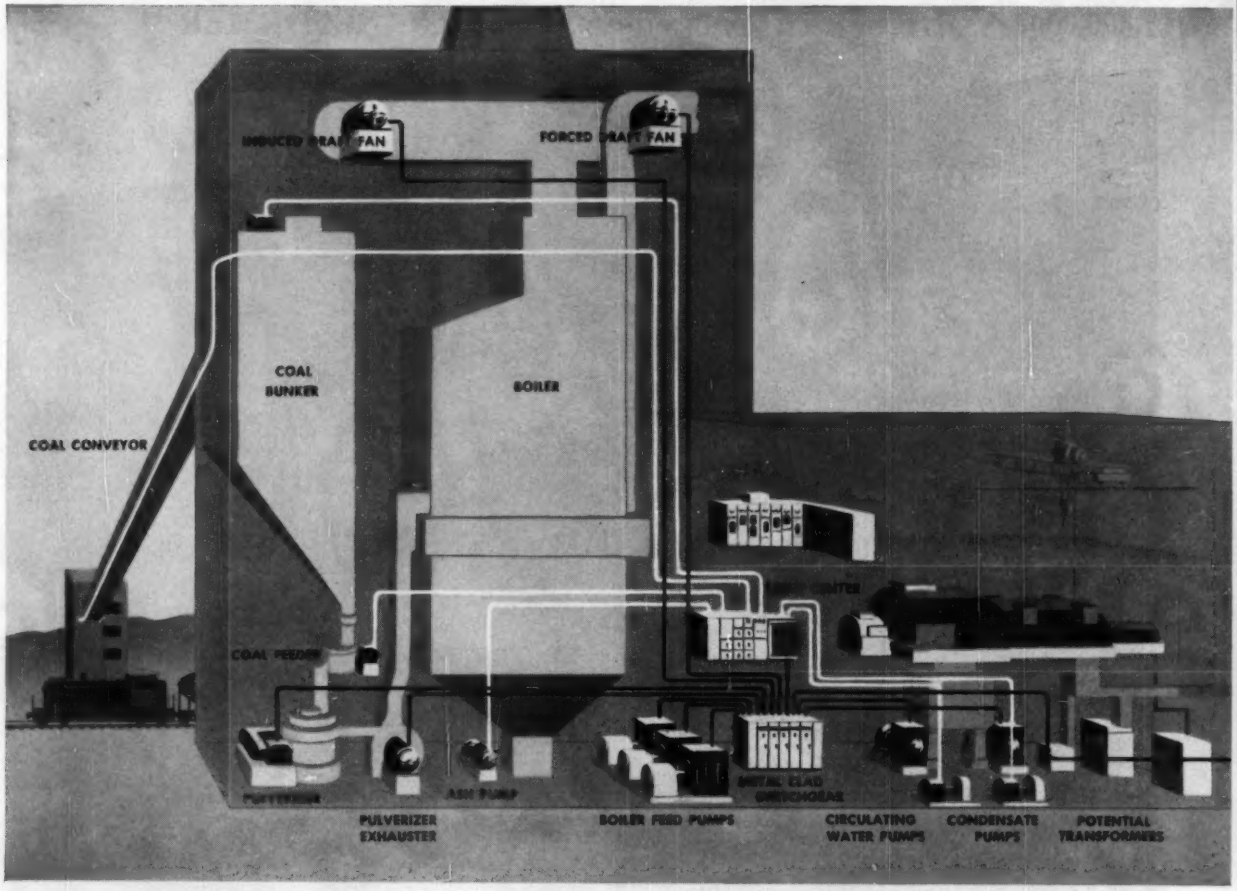
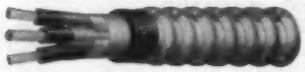


Types of General Electric Interlocked Armor Cable



VARNISHED-CAMBRIC INTERLOCKED ARMOR CABLE WITH THERMOPLASTIC JACKET UNDER THE ARMOR—For interior and exterior installations above grade or where exposed to moist atmospheres.

SUPER CORONOL* GEOPRENE* INTERLOCKED ARMOR CABLE—For industrial and electric utility power circuits in wet or dry locations.

TYPE AVAI INTERLOCKED ARMOR CABLE—For high-temperature applications in dry locations.

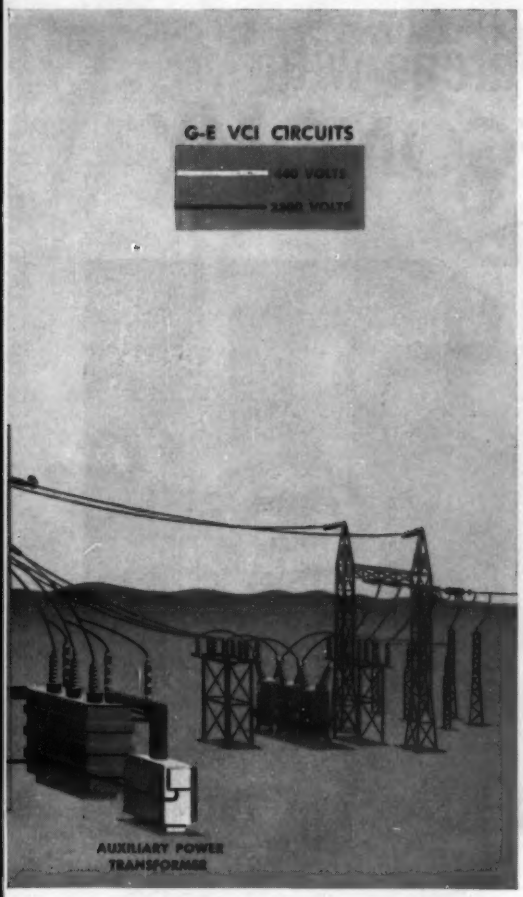
VARNISHED-CAMBRIC INTERLOCKED ARMOR CABLE WITH PLASTIC JACKET—For 5000-volt power circuits in central and substations, industrial plants, and in similar locations. The plastic jacket under the armor makes this cable suitable for outdoor installations above grade.

VARNISHED-CAMBRIC INTERLOCKED ARMOR CABLE—For 5000-volt power circuits in central and substations, industrial plants, and in similar applications. Dry locations.

VARNISHED-CAMBRIC INTERLOCKED ARMOR CABLE WITH PLASTIC JACKET—For 15,000-volt power circuits in central and substations, industrial plants, and in similar locations. The plastic jacket makes this cable suitable for indoor or outdoor installations above grade.

VERSATOL* GEOPRENE* INTERLOCKED ARMOR CABLE—For 600-volt power circuits in central and substations, industrial plants, and similar applications.

INTERLOCKED ARMOR CABLE WITH POLYVINYL CHLORIDE COATING OVER THE ARMOR—For applications where the atmosphere is corrosive to steel, aluminum, or bronze armor. The polyvinyl chloride jacket is chemically resistant to practically all of the corrosive conditions to which a cable may be exposed. In addition, the jacket can be supplied in vivid permanent colors to provide circuit identification.



How to cut costs of station auxiliary feeders with General Electric interlocked armor cable

Increased complexity and higher material and construction costs make generating stations more costly to build and equip than ever before. And, of course, the stations built today must meet the electrical needs of 20 and 30 years from now, as well as present requirements.

Today, most utility engineers are paying closer attention to the selection of cable—because it's one way to meet both today's and tomorrow's requirements and still hold costs in line. They're finding that General Electric's interlocked armor cable systems provide savings in materials, space, installation and maintenance costs and, in addition, offer a wide choice of insulation and armor.

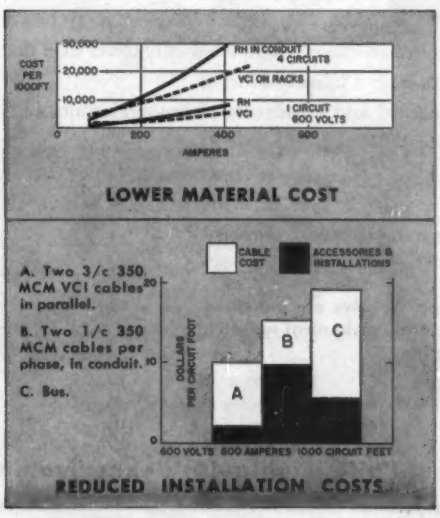
G-E interlocked armor cables cut installation costs because they're designed for easy pulling and bending. The armor on General Electric interlocked armor cable, for example, is the result of years of development of special materials which enable the armor to be manufactured with a configuration that resists flattening, snagging or opening up of the armor under severe pulls or bends. This makes the cable flexible and easy to pull.

The G-E line of interlocked armor cables includes cable with a variety of ratings, insulations and jackets (shown at left). This means you can get cable with the features you need—whether for wet or dry locations, superior resistance to corrosion, or high temperatures. Furthermore, G-E interlocked armor cable systems provide exceptional flexibility of arrangements.

General Electric also offers you expert engineering assistance. This service, plus the correct cables, can help you keep station auxiliary feeder costs low both now and in the long run. For specific information, write: Section W202-1127, Wire and Cable Department, General Electric Company, Bridgeport 2, Conn.

*Registered Trade-mark General Electric Company

VARNISHED-CAMBRIC INTERLOCKED ARMOR CABLE—For 600-volt power circuits in central and substations, industrial plants, and in similar dry locations.



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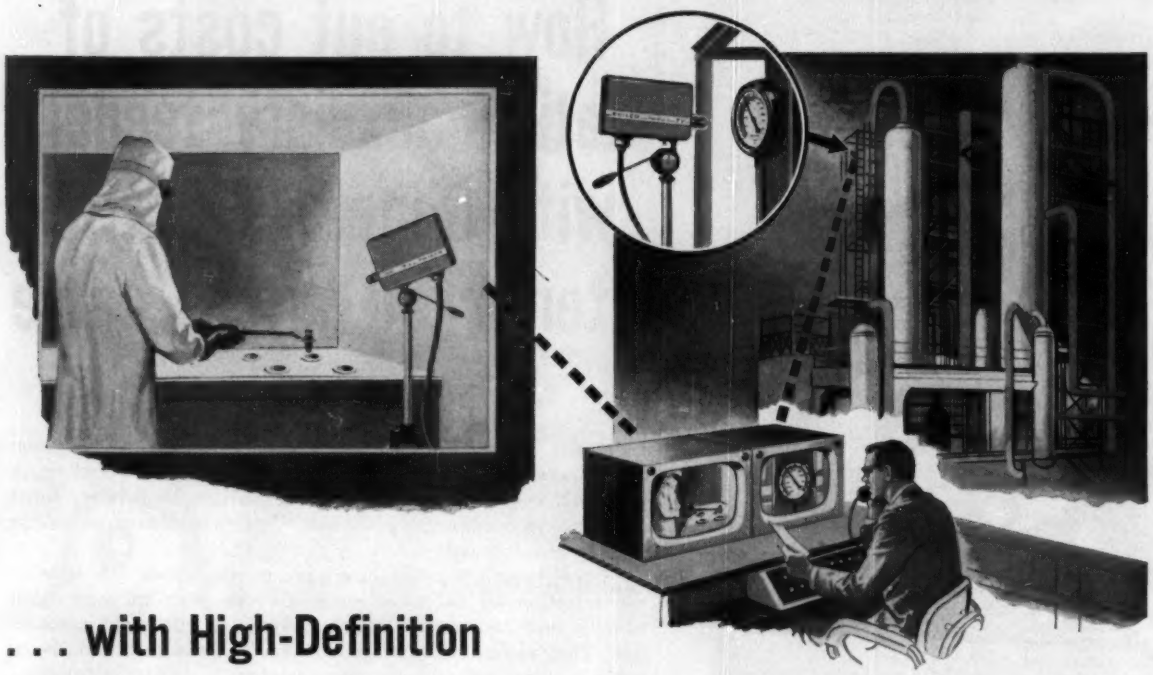

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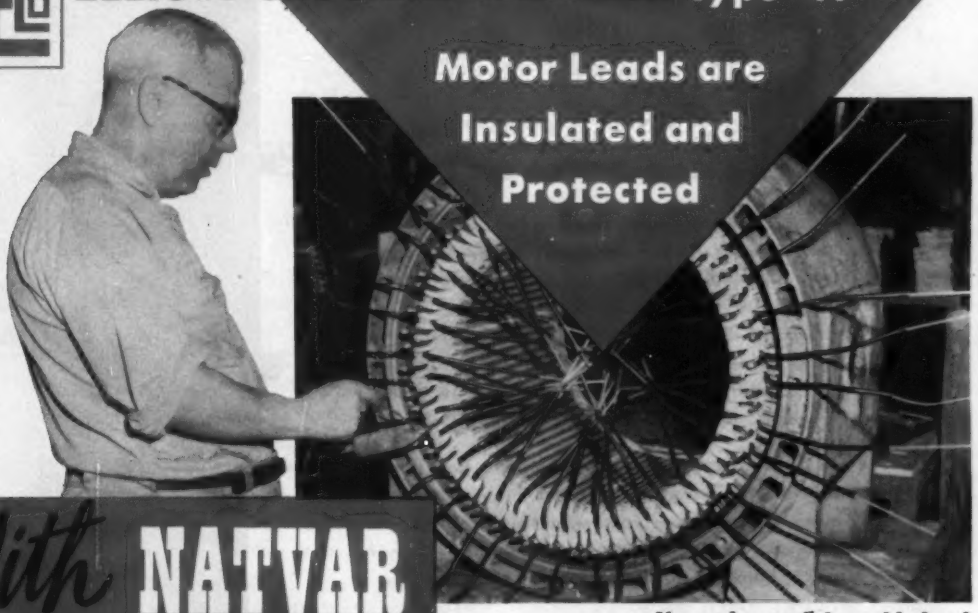
ELLIOTT CROCKER-WHEELER Type "N"

Motor Leads are Insulated and Protected



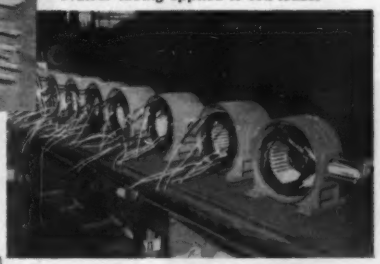
Natvar tubing installed on coil leads and connectors of a larger a-c motor.

With NATVAR

VINYL COATED FIBERGLAS TUBING

Natvar vinyl coated fiberglas tubing, as applied to these a-c field coil leads, gives ample electrical protection and flexes easily.

▼ *Line-up of NEMA frame motors with Natvar tubing applied to coil leads.*



The Crocker-Wheeler plant of Elliott Company builds a wide variety of electrical motors in sizes up to 200 hp. Natvar vinyl coated tubing is widely used on Crocker-Wheeler a-c induction motors in both large and small ratings.

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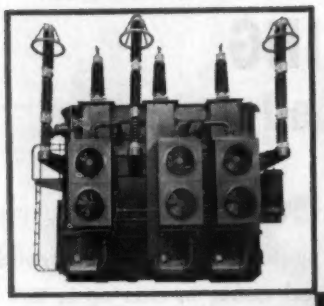

Recently installed Moloney Power Transformer. Rated 135,000 KVA, 3 phase, 60 cycle. F.O.A. Outdoor Type, High Voltage 115,000 Y/66,400; Low Voltage 13,800 Delta.

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EDITORIALS

Appliance Servicing—The Rotten Apple

"Mary, you can't leave my house before you see my wonderful new washer-dryer."

Every day this scene is being repeated by many proud owners of all kinds of electrical appliances in homes throughout the land.

But alas, our happy housewife has no idea of what is in store for her when that new appliance develops mechanical or electrical trouble. If she lives in New York, she may wait weeks for a service man. She may have to answer a quiz on her financial responsibility before she gets on the list for service. She will certainly have to arrange her schedule to be at home when the service man arrives. All this is to assure the payment of his exhorbitant charge.

This is a severe—but probably true—picture of the service problem in the electrical industry today.

Fortunately, the industry is beginning to stir. Manufacturers themselves are beginning to come to grips with this problem which could easily be shoved aside as long as sales were increasing rapidly.

In 1954, the Association of Edison Illuminating Companies initiated a committee activity to study the problem. Through this association and the efforts of Committee Chairman E. O. George, much progress was made in pointing up the service problem. Efforts have been directed primarily in the area of making the appliance servicing operation easier so that the cost could be reduced. This work has been carried on by the committee under the chairmanship of W. H. Wagner and further progress has been made particularly in interesting the National Electrical Manufacturers in this field.

It is significant that the committee has adopted this statement of utility attitude regarding appliance service: "It should be the responsibility of utilities to see that reasonably priced service is available in their respective areas."

This is a big order, but it is an important one. If the rotten apple of "appliance service" is not removed from the barrel, the whole market may be spoiled.

Does The Motorist Prefer Poles?

Distribution lines have been strung on poles since electric service pushed beyond the confines of Pearl Street 75 years ago, this year. And for almost as many years the replacement of overhead distribution with underground has been urged by certain groups to avoid the "unsightliness of poles and wires." Following sleet storms and hurricanes, the clamor has been loudest, quieting somewhat as utilities have repeatedly demonstrated the costliness of such proposals. But today a new voice is sometimes heard.

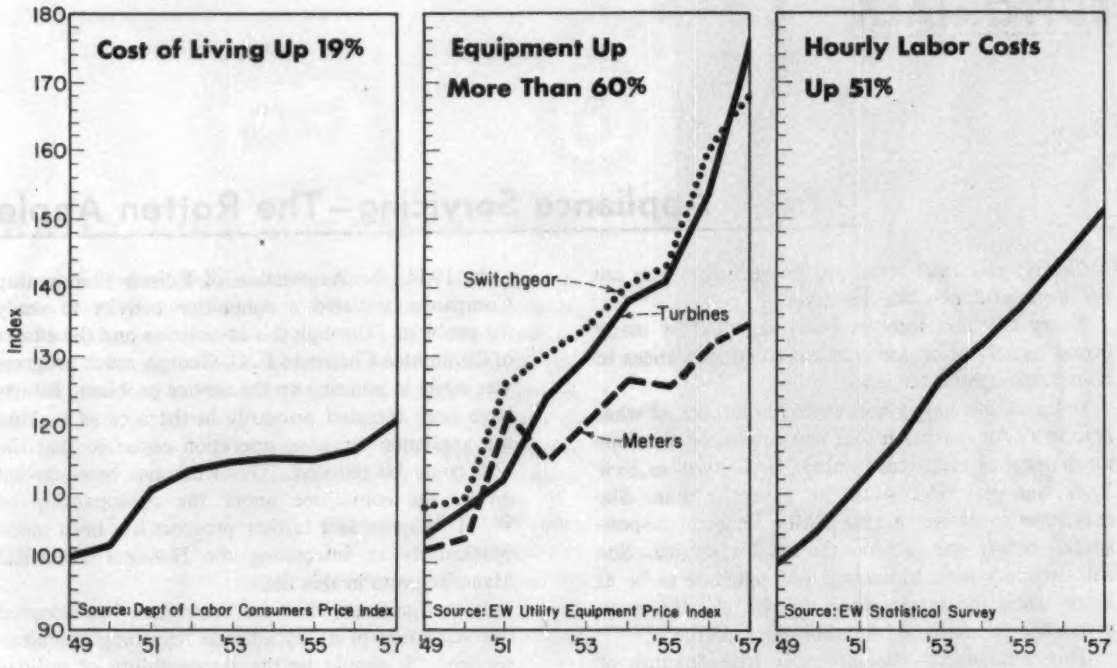
This new voice is the motorist protesting the inconvenience of inching his car through a traffic jam induced by utility men working in a manhole. According to a recent suburban newspaper editorial, this motorist demands a hearing in the planning of underground distribution.

"Why," he asks, "do manholes have to be placed in the middle of busy thoroughfares? Why can't manholes be placed in sidewalks? Or, better yet, if the equipment could be suspended 25 feet above ground where traffic is very light, there would never be a traffic problem."

Equipment suspended 25 feet in the air needs more than words to keep it there. The motorist is vague on this point but poles are the most practical means of support and long experience has proved their worth. Can it be that motorists now prefer pole lines?

Underground distribution has long been promoted as the panacea for enhancing the beauty of proud communities. Some utilities have yielded to such pressure in shopping centers and a few residential developments. But the cost of underground distribution has remained an effective deterrent to extensive use. Few utilities have been willing to commit themselves to the expense of under-street distribution.

Today, as engineers continue their efforts to improve the continuity and load capability of distribution plant, they are turning more and more to cabled conductors. Experience is proving that cable strung on poles or buried in street boundary strips provides most of the advantages of duct-and-manhole construction under pavement at far less cost. Such cable construction seems to meet demands for sightly distribution without slowing the motorist's pace.



Can Electric Utilities Hold the Line

• Equipment costs, wages, and high cost of money portend more activity in realigning rates

• So far in '57, annual rate increases total $54 million for U. S. companies; $51 million requested

Spiraling prices for equipment, labor, as well as the cost of money, are again posing a problem in the electric utility industry on the question of further rate increases.

Past rate hikes have been modest compared with other regulated industries. The increases were much less than for goods and services of other industries operating in the free, competitive market.

Reason why utilities asked for relatively modest hikes in the years following World War II were due to these principal factors:

- Ability to finance at low money rates.
- Tremendous technological advances, particularly in power plant design and operation.

These factors enabled utilities to offset some of the severe postwar inflationary pressures.

Looking at it now, the situation has been reversed. Utilities now face rising money costs and the prospect of slower advances in the rate of technological progress.

With respect to money costs, the New York Public Service Commission, in its recent order granting New York Telephone Co a rate increase, noted: "There is nothing in the evidence before us that would indicate that the cost of money will decline."

The commission further said that "with a substantial increase in the cost of debt there well may be an increase in the costs of equity more marked than has yet appeared."

Technological Benefits Slacken

Although further increases in efficiency may be expected, future technological gains will be at a considerably lower rate than they were immediately after World War II.

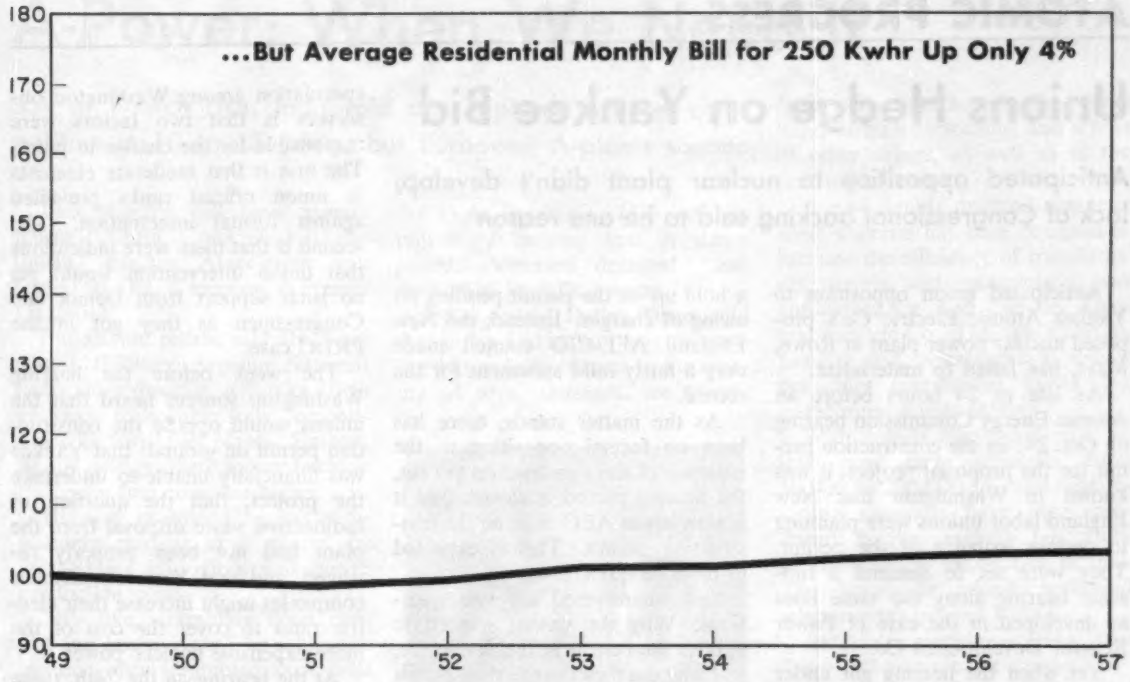
For example, in the last three years in which the industry's coal rate was below one lb per kwhr the annual rate of decline amounted to only 0.18 lb per kwhr. In the three preceding years the rate was at 0.28 lb per kwhr, or nearly 56% greater. The cost of fuel per kwhr declined continuously from 1949 through 1955. Significantly, it began to turn up in 1956.

While labor costs, equipment prices, and the consumer price index all registered substantial gains since 1949, the average residential monthly bill was up only 4%.

So it appears that the forces for rate hikes are beginning to push bulges into the "line" which utilities have been defending. Unless some unforseen economic force comes along to reinforce the utility camp, it appears more rate hike applications will be the order of the day.

Although rate increases granted so far in 1957 total over $54 million annually, note that three companies account for over $50 million of the total. For rate increases still pending, two companies are asking for over $33 million of the $51 million requested.

Indications point to public accept-



Against Further Rate Increases?

ance that utilities are no different than other industries that have had to raise product prices. The slightly higher rates the electric utility industry must charge will be viewed as fair and equitable by most customers.

This is reflected in a recent round-up by Electrical World. A sampling of customer reactions to recent rate boost brought these comments:

"I'm not happy at the thought that my electric bill will be higher next month," said one residential customer where average domestic rates went up 32¢ a month. "But I don't think this was unreasonable."

A representative of a manufacturers' group said: "There's nothing in the PUC order that I could criticize. It spreads the revenue requirement fairly. . . . I don't object to utilities earning a fair rate of return." But farm groups, claiming a cost-price squeeze, were dissatisfied.

Here are the companies in 1957 that . . .

Got increases		and these seek hikes*	
Arkansas Power & Light	$ 1,800,000	Boston Edison	$ 2,488,000
Granite State Electric	105,000	California Electric Power	2,000,000
Minnesota Power & Light	496,000	Commonwealth Edison	25,200,000
Montana-Dakota Utilities—Wyoming	86,300	Consolidated Edison of N. Y.	8,205,700
Niagara Mohawk Power	8,225,000	Housatonic Public Service	664,000
Pacific Gas & Electric	16,967,000	Kentucky Utilities	2,500,000
Public Service of New Hampshire	165,000	Louisville Gas & Electric	2,200,000
Southern California Edison	25,000,000	Missouri Power & Light	678,000
Southern Indiana Gas & Electric	1,200,000	Montana-Dakota (3 states)	1,124,000
		Montana Power	3,800,000
		Plymouth County Electric	251,500
		Southern Nevada Power	1,100,000
		Worcester County Electric	1,300,000
Total Increases	$54,044,300	Total	$51,511,200

* Approximate

Unions Hedge on Yankee Bid

Anticipated opposition to nuclear plant didn't develop; lack of Congressional backing said to be one reason

Anticipated union opposition to Yankee Atomic Electric Co's proposed nuclear power plant at Rowe, Mass, has failed to materialize.

As late as 24 hours before an Atomic Energy Commission hearing on Oct. 24, on the construction permit for the proposed project, it was known in Washington that New England labor unions were planning to oppose issuance of the permit. They were set to demand a full-scale hearing along the same lines as developed in the case of Power Reactor Development Co.

Yet when the hearing got under way, although a labor representative appeared, there was no request for a hold up on the permit pending an airing of charges. Instead, the New England AFL-CIO council made only a fairly mild statement for the record.

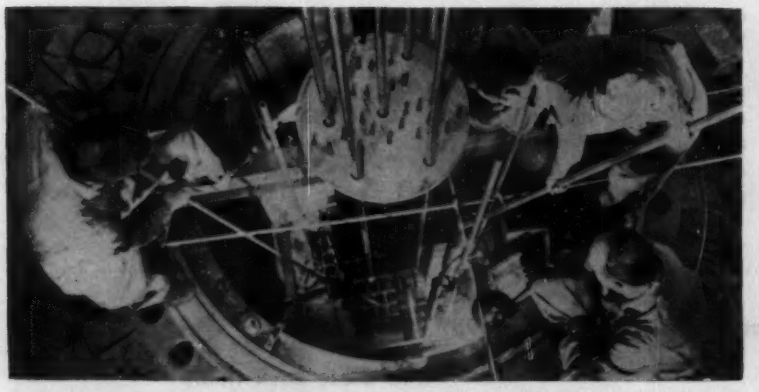
As the matter stands, there has been no formal opposition to the issuance of the construction permit, the hearing record is closed, and it is now up to AEC to issue the construction permit. This is expected to be done quickly.

Left unanswered are two questions: Why the unions wanted to oppose the permit in the first place, and why did they change their minds after they had decided to intervene?

Union officials aren't talking but speculation among Washington observers is that two factors were responsible for the change in plans. The first is that moderate elements in union official ranks prevailed against formal intervention. The second is that there were indications that union intervention would get no such support from Democratic Congressmen as they got in the PRDC case.

The week before the hearing Washington sources heard that the unions would oppose the construction permit on grounds that Yankee was financially unable to undertake the project, that the question of radioactive waste disposal from the plant had not been properly resolved, and that Yankee's member companies might increase their electric rates to cover the cost of the more expensive nuclear power.

At the hearing on the 24th, these points were submitted for the record. However, it was not asked that the construction permit be held up but merely that AEC look into these aspects.



First Private Plant Goes on Line

Nuclear fuel elements are loaded into core of Vallecitos Atomic Power Plant in preparation for start-up of the first all privately financed atomic electric power station. Owned by Pacific Gas & Electric Co and General Electric Co, the 5,000-kw plant began feeding power into the utility's system Oct. 24. The Pleasanton, Calif., plant took only 17 months to complete. GE appropriated $3 million for the project but spent $2.5 million. Land, supporting facility, and administrative expenses weren't included in the appropriation. PG&E paid an additional $½ million for the turbine generator.

The boiling water reactor will undergo tests to develop operating data for the 180,000-kw Dresden Station. GE is building Dresden for Commonwealth Edison Co and Nuclear Power Group, Inc. PG&E is a Nuclear Power Group member, as is Bechtel Corp, engineer-constructor for the Dresden facility.

Gore Calls Atom Power Race a Grim Challenge

Russia's aim to beat the U. S. in atomic power developments presents a grim challenge. This is Sen Albort Gore's reaction after viewing facilities and "their broadly based technical education system."

In a series of three copyrighted New York Herald Tribune articles, the Tennessee senator wrote of of Russia's progress. He was told about a 420-Mw pressurized water reactor expected to be completed in 1960. The Russians also plan a 400-Mw atom plant. The senator saw neither of these stations but did visit a 5-Mw plant near Moscow. He described the engineering as "nothing short of good, and very good."

Gore called public vs. private power disputes "the biggest millstone around the neck of the U. S. reactor program." He recommended concentration of skills and resources of both in order to meet the challenge. He urged national and state education programs to gain broadly based technological training.

A-Power: When We Need It

IEA at French Lick, Ind., told our A-plants will be competitive in 10 to 15 years, but European A-plants sooner

This country will have atomic power because it will need it, the Indiana Electric Association was told at its Oct. 2 meeting at French Lick, Ind.

But atomic plants, said Dr. Norman J. Hilberry, Argonne National Laboratory director, will take 10 to 15 years to become fully competitive with fossil-fuel plants. Europe, he said, will get there sooner because European fuel costs are higher.

Hilberry cautioned against complicating nuclear cost figures by "scrambling plutonium and power production costs."

"It's like scrambling flood control and power costs," he said, adding that once scrambled such costs can't be unscrambled.

The IEA heard Edwin Vennard, vice president and managing director, Edison Electric Institute, dispute the Tennessee Valley Authority's constitutionality on the basis of its definition in 1935. Flood control and navigation, he said, today are "incidental" to TVA's production of electric power.

"TVA generates 75% of its power by burning fuel in steam plants," Vennard declared, "and only 25% by falling water."

J. F. Leopold, Dallas, Texas, said that today Uncle Sam was competing with private citizens in the making of rope, sausages, ice cream, false teeth, spectacles, ships, guns, flags, furniture, clothing, and a host of other things, as well as in the roasting of coffee.

EDWIN VENNARD of EEI charges TVA is unconstitutional by 1935 definition

A new doubly oriented magnetic sheet material has been designed to increase the efficiency of transformers, motors, and generators, it was announced by Ned Landon, General Electric Co. The new material, Landon said, is expected to reduce not only transformer losses but transformer noises as well.

With defects eliminated, iron alloys now have strengths from 30,000 to 200,000 psi, and heat-resisting materials have been produced in the research laboratory for use in electronic circuits, he said. The latter, he added, withstand temperatures beyond 1,600F.

Indiana's electric utilities face "very real government competition" in the proposal of nine Rural Electric Cooperatives to build a $42-million steam plant near Petersburg, Ind., warned P. W. Ross, IEA president and vice president, Indianapolis Power & Light Co.

The proposed generating plant, Ross declared, would supply not only the nine cooperatives but an aluminum plant as well.

WASHINGTON WIRE

Glen Canyon a Pact 'Threat'

Top officials from Colorado Basin area charge new plan for "cash register" project infringes on former contracts

The sanctity of government contracts based on Hoover Dam power may be threatened by the impounding of Colorado River water behind the Glen Canyon Dam in 4 or 5 yr.

This was the charge made to Interior Department last week at a meeting in Washington that drew the top-most political figures from the Colorado River basin states.

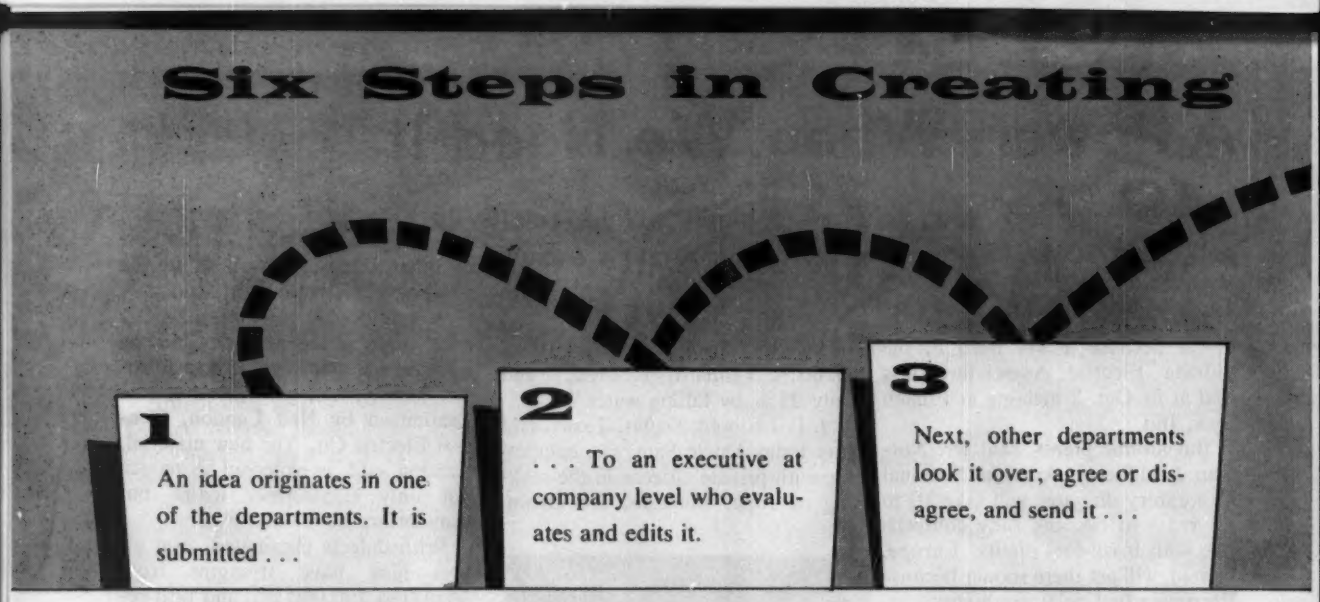
United in an unprecedented coalition, Arizona, California, and Nevada spokesmen are demanding that Interior Secy Fred Seaton guarantee fulfillment of their U. S. power contracts during construction of Glen Canyon Dam and the filling of the reservoir behind it.

Lower basin spokesmen attacked a preliminary study of the problem put out three weeks ago by Reclamation. They offered a substitute statement stipulating:

- "The U. S. shall not impair the performance of its Hoover Dam power contracts."
- In any year when inflow into Glen Canyon reservoir exceeds the requirements for consumptive use below the dam (irrigation, domestic, and industrial water), the government shall release half the excess.

These releases not only would help to assure full output of contracted-for firm power at downstream plants but also would add to the production of secondary energy. This secondary energy is likewise sold under existing contracts, which specify it is to be generated when and if water is available.

Lower basin spokesmen argue that Glen Canyon—for which Reclamation awarded the main dam and powerhouse contract on a $107-million low bid just six months ago—is the "cash register" project that has to repay most of the cost of all others in the authorized upper basin.


Six Steps in Creating
1
An idea originates in one of the departments. It is submitted . . .
2
. . . To an executive at company level who evaluates and edits it.
3
Next, other departments look it over, agree or disagree, and send it . . .

West Penn Writes Down Its Policy

JOHN MUELLER, Manager of Planning, West Penn Power Co, Cabin Hill, Greensburg, Pa.

If a company is small enough, it needs no policy program. The head of the firm can make all the decisions.

But as soon as a company grows large enough to have more than one executive, a need to coordinate their plans and orders appears. And when the company's operations hinge on the decisions of many executives, widely dispersed, some with line and some with staff duties, a basic statement of what they are together trying to do becomes a necessity.

With West Penn Power Co's growth and decentralization, the time came when such devices as personnel regulations, general orders, and office manuals were not enough to guide management people adequately.

Program Begins

Therefore early in 1954 West Penn embarked on a program of establishing a more formalized policy. The president assigned one man to administer the program.

The first problem in making policy is defining the word.

The word "policy" has been applied to everything from engineering standards to procedures for handling paperwork. Each company, therefore, has to make its own definition. West Penn defines a policy as a broad, basic rule established by top management to guide performance of company activities.

Policy is reduced to essential principles. Unencumbered by details, it lets the big issues stand out clearly for consideration by top management. And more important, the top three levels of management (president, vice presidents and managers), for whom policy is intended, are guided by principles rather than by detailed instructions. Within the broad framework of policy they are free to meet local situations in the way they feel is best.

Policy Program Goals

- To coordinate decentralized operation in keeping with long-range company objectives.
- To provide a communications vehicle by which staff departments can formally contribute to policies that guide line organizations.
- To permit authority to be delegated close to the point where action must be taken.
- To eliminate the need for individual decision on repetitive matters.
- To prevent snap decisions to meet immediate problems.
- To produce coordinated, consistent action between all divisions and departments.

Policies frequently are the basis for more detailed and specialized procedures, but these procedures are for the use of workers and the first two levels of supervision.

Objective Is Stated

At the beginning of West Penn's program, before any policy was written, top management stated simply its basic objective . . .

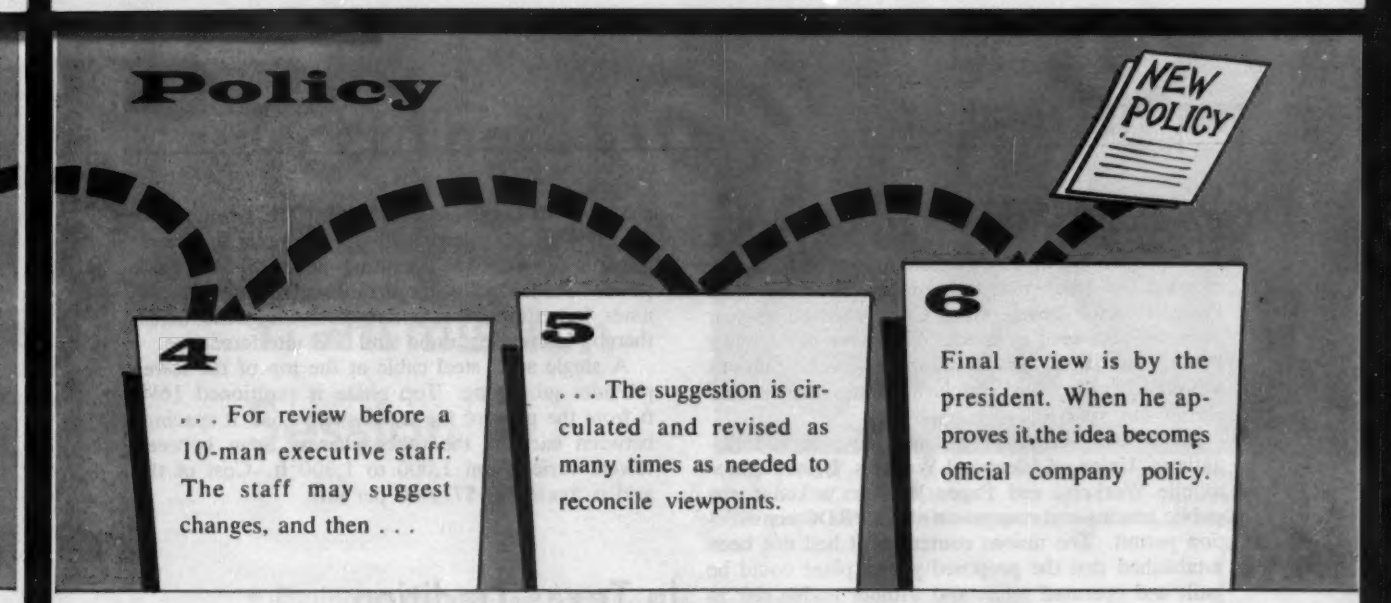
"To supply customers adequate and reliable electric service at the lowest rate consistent with fair treatment of employees, reasonable earnings, and our obligations as a citizen in the communities we serve."

The next step was to expand this into a broad policy which would tell how the company expected to reach its basic objective. Here is that policy:

"To supply the electric service customers need—where and when they need it—with a reliability and a quality that meets their requirements—and at the lowest rates consistent with sound operation, fair wages, and the proper return on the fair value of our property.

"To provide fair wages, benefits, and working conditions for employees—with minimum fluctuations in employment—and with ample opportunity for self-improvement and advancement.

"To earn a proper return on the fair value of our property—to maintain a sound physical property and


Policy
NEW POLICY
4
. . . For review before a 10-man executive staff. The staff may suggest changes, and then . . .
5
. . . The suggestion is circulated and revised as many times as needed to reconcile viewpoints.
6
Final review is by the president. When he approves it, the idea becomes official company policy.

– Here's How It Tackled the Job

a sound financial structure—to compensate present investors adequately and attract new capital as required for expansion and other business needs.

"To participate in activities designed to bring about community growth and betterment—to maintain a constructive and forthright working relationship with regulatory and other governmental bodies—to promote beneficial uses of electric service—and to cooperate with the electric industry in activities relating to the generation, distribution, and use of electric energy."

Policy as broad as this can be regarded as management philosophy. It is a screen through which all other administrative policy has to pass. In making decisions general management uses this basic policy to keep company operations pointed toward the overall goal, rather than make decisions on the more limited single function viewpoint.

Anyone May Suggest Policy

Suggestions for policies can orginate anywhere in the organization, but policy formulation is up to general management. A typical policy goes through the following steps:

1. Someone in a department comes up with some basic rules which he feels should be adopted as company policy. The department head, if he agrees, passes them along as a recommendation to the company executive assigned the duty of assisting in policy administration.

2. This executive reviews the recommendation for consistency with general company objectives, organizational responsibilities, and policies already established. He then edits it for consistency in style with other policies.

3. Next, line or other particularly interested departments get a chance to agree or disagree. This is usually the most time-consuming step.

4. The proposed policy, together with an analysis of it, is then sent to the ten members of the executive staff for their review. They are requested to submit their suggestions within ten days.

5. Proposed policies may be revised and circulated many times to try to reconcile different viewpoints.

6. A recommendation finally becomes adopted company policy upon approval of the president.

All policies are included in a loose-leaf Administrative Policy Manual held by approximately the top three levels of management, about 85 men in all. The initial program calls for about 100 policies.

Typical Policy Subjects

Here are a few typical titles: Plan of Organization, Memberships in Community Service Organizations, Credit and Collection, Purchasing, Appliance Service, Employment of Married Women, and Salary Standards.

When the policy manual was first distributed, the president said, "I am convinced that no operations can progress more rapidly than the employees who are charged with the responsibilities of management. The Administrative Policy Manual is designed to help you grow as your authority grows, and to assist you to fulfill your ever increasing responsibilities."

West Penn Power Co's experience in formalizing policy indicates that it is not easy but that it produces rewarding results. What comes out as a simple, short, straightforward policy may have back of it hours of work by many members of top management. However, West Penn Power Co feels that this is one valuable and effective way to gear operations to basic company objectives.

Which Statement Is Policy?

A. Buy this $200,000 data processing equipment because it will save $75,000 a year.
B. Equipment is purchased whenever it will pay for itself in three years or less.
C. All receipt writing will be done with indelible pencils.

Answers: A is an individual decision; C is an administrative procedure; Only B is policy.

Go-Ahead Asked for Reactor

A special Atomic Energy Commission staff recommended last week that the construction permit for Power Reactor Development Co's proposed nuclear plant be continued in effect. The move came when PRDC, the special AEC staff, and intervening unions submitted findings and conclusions on a hearing held earlier this year.

When AEC originally granted the permit, International Union of Electrical Workers, United Automobile Workers, and Paper Workers asked for a public hearing and suspension of the PRDC construction permit. The unions contended it had not been established that the proposed power plant could be built and operated safely and without undue risk to the public at the Monroe, Mich., site.

The AEC staff recommended that construction be continued subject to these minor amendments: **1.** Six-month reports from PRDC on progress of experimental work needed before plant safety is determined. **2.** Reserve the right to AEC to reopen the hearing at any time to take further evidence.

In its wrap-up, PRDC argued that the hearing evidence demonstrated the plant can be built and operated safely. The unions contended there still is insufficient assurance on this point. The unions also charged unfair hearing treatment, saying AEC Chairman Strauss should disqualify himself because of his bias.

'Hog Fuel' Conversion

Portland General Electric Co is constructing a 4-million gal oil tank at its 85,000-kw Station L plant. The tank will be supplied directly from tankers.

Originally designed to use "hog fuel" lumber mill waste as basic fuel, the 47-year-old plant is undergoing the conversion because of dwindling supply of lumber scrap in the Portland area. After two boiler changes, the plant's 11 boiler units will operate on oil or a combination of oil and gas. Use of hog fuel will remain possible in five units.

The job will cost $1.1 million, including some expansion and modernization work.

380-Kv Grid Energized

McGraw-Hill World News—West Germany energized the first section of her national grid at 380 kv earlier this month. Main feature of the grid's postwar additions is a four-wire bundle which has a design voltage of 400 kv, 50 cps, 3 phase. These single-circuit bundles are carried by 165-ft steel lattice towers.

The 1.1-in. diam cables consist of 240 sq-mm aluminum cross section with a 40 sq-mm cross section steel core. Cables are arranged in the corners of a square, 40 centimeters on a side. The arrangement provides a highly improved characteristic for transmission of 400-Mw operating and 600-Mw peak power. Additionally, the arrangement largely eliminates formation of extended electromagnetic fields, thereby preventing radio and TV interference.

A single solid steel cable at the top of the tower provides grounding. Top phase is positioned 16½ ft from the peak of the tower, with 26½ ft spacings between each of the other phases. Span between towers varies from 1,000 to 1,300 ft. Cost of the grid is figured at $71,000 per mi.

In Texas Tradition

Big power plans are underway in the Lone Star State. Here are some recent developments:

Texas Utilities Co, parent firm of three power companies, plans to install 1,180 Mw of generating capability between 1957 and 1960. The additions are needed to serve some 200 Mw of new load that will come on the line in the next two years.

This was revealed by George L. MacGregor, TU president, before New York security analysts last week. The company is spending about $76 million on construction this year, he said. Some $175 million is budgeted for 1958-59. TU subsidiaries are Texas Electric Service Co, Texas Power & Light Co, and Dallas Power & Light Co.

Houston Lighting & Power Co has increased the estimated cost of its five-year expansion program to about $272 million. This is a $42 million hike over previous estimates, Pres W. A. Parish told the New York analysts earlier this month.

West Texas Utilities Co expects to spend $51 million on electric facilities in the next five years. Nearly half of this will go for a new power plant, said Pres Cal Young.

Gravity Power Next?

Circular motion machines that utilize gravity are capable of powering everything from hearing aids to space cruisers. This, according to Associated Press, is the claim of Otis T. Carr, 52, president of OTC Enterprises, Inc, of Baltimore, Md. He backed his claim by demonstrating a crude model of a circular motion machine embodying the principle of a "free energy circular foil" space craft. Carr said the machine can be adapted to devices of any size to produce continuous power "absolutely" free of dissipation.

Carr and his associates lack formal science or engineering education, he said. Their claims are based on simple practical applications of natural laws and discoveries. All they need now, Carr told reporters, is the money to produce the machines.

Lightning Sparks AIEE Transmission Session

W. L. EVERITT (right) ACCEPTS EDUCATION MEDAL from AIEE Pres. W. J. Barrett as T. G. Ayers, Commonwealth Edison, looks on. Everitt is engineering dean of U. of Illinois

- **Engineers debate method used to design lightning-proof line**
- **Field and lab tests seek reason for unexpected failures at EHV**
- **Other groups discuss generation economy, shopping center supply**
- **High frequency grows in industry; doctors study resuscitation**

Interest ran high in the design of transmission to withstand lightning stresses at the American Institute of Electrical Engineers' Fall General Meeting at Chicago early last month. Spurred on by unexpectedly high flashover rates encountered by Ohio Valley Electric 345-kv lines and new Commonwealth Edison designs for 138 kv, engineers offered a variety of proposals ranging from reappraisal of the basic electrostatic and magnetic theory to revision of the so-called AIEE Method. The situation was aptly depicted by Lawrence Brieger, Consolidated Edison, who said he had run headlong into the "clouds surrounding lightning protection theory" when he sought data to design a 5,600-ft 138-kv river crossing between 550 to 650-ft towers.

OVEC's system experienced 12.60 flashovers per 100 miles in 1956, 70% of them involving top phase only and 25%, middle phase only. Field measurements described by R. H. Schlomann and W. S. Price, American G&E Service Corp, and I. B. Johnson and J. G. Anderson, General Electric Co, revealed one maximum stroke in excess of 89 kiloamp and a median between 30 and 40 kiloamp. Total strokes recorded on the 20 miles of test sections was 44 vs 38 predicted.

This unexpected failure rate was attributed to impulse characteristics of the towers by W. S. Price and R. B. Finn, Jr., also of AG&E, and R. Lundholm of Chalmers Tekniska (Sweden) rather than to shielding failures or surge drop in ground connections. They reported an investigation of the inductance and surge impedance of towers which revealed that:

1. Potential differences which can be computed occur in the tower itself under surge conditions, contrary to previous design assumptions.

2. A 50-kiloamp, steep-front stroke can cause momentary voltages high enough to flash an 18-unit insulator.

3. Voltage across the top insulator string crests at approximately the round-trip time to tower ground when the front time is less.

4. Insulation stress increases with tower height, reaching very high values for river crossings.

In discussion, C. J. Miller, Ohio Brass, confirmed these conclusions with traveling wave theory.

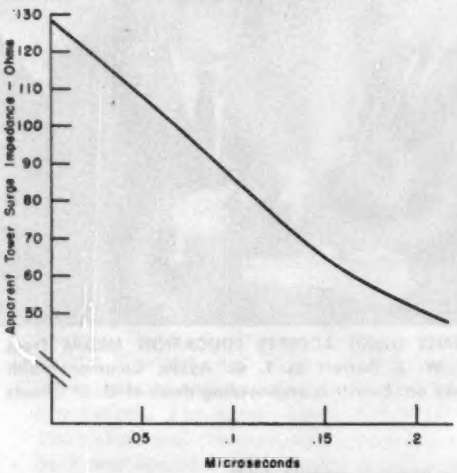
Tower Impedance Tested

Field measurements on a typical AG&E tower reveal a surge impedance dropping from an initial 135 ohms to a final value of 60, reported G. D. Breuer and A. J. Schultz, GE, jointly with Schlomann and Price. Propagation in the tower was measured at 940 ft per microsec. They suggested that omission of these factors from accepted methods of predicting line performance might partially account for the excessive flashover rate.

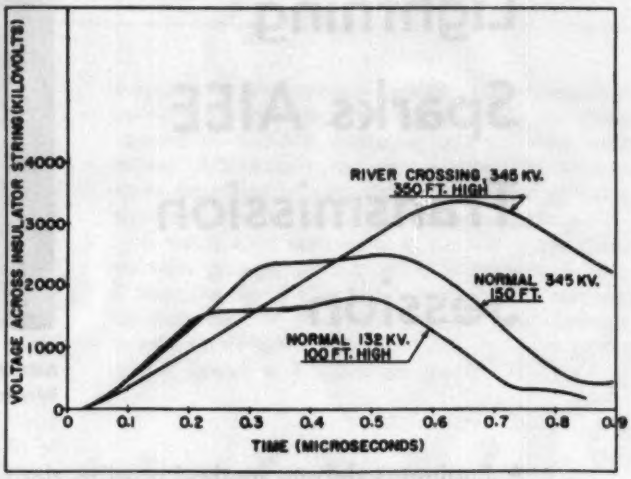
After one year of unexpectedly frequent tripouts on 138-kv tower lines designed with a single ground wire, Commonwealth Edison Co has redesigned the structures to take a second ground wire, said E. F. Koncel, Jr, in a paper prepared jointly with R. W. Caswell of Commonwealth and I. B. Johnson and H. R. Schultz of GE. Tripouts of lines built during the single-ground-wire period have averaged 11.44 per 100 miles per year vs 1.24 for older double-circuit, double-ground-wire lines. The new lines differ mainly in being about 20 ft higher and providing more conductor spacing, thereby cutting the coupling factor from 0.35 to 0,20.

Field investigation of the unsatisfactory design revealed tower surge impedances from 165 ohms down to 50 and propagation at nearly the speed of light, they said. Surge impedance of the single ground wire measured 520 ohms; adding the second wire cut this to 288 ohms.

Laboratory tests with a scale-model transmission line confirm previous concepts of charge distribution in the lightning pilot streamer and give a measure of stroke capacitance, reported J. G. Anderson and J. H. Hagenguth, both of GE. They



SURGE IMPEDANCE of transmission tower has time function, according to recent field tests



CREST VOLTAGE ON TOWER-TOP INSULATORS shows effect of tower height, according to two different methods of investigation

also compared the geometric and electrical characteristics of OVEC's 345-kv construction with a somewhat similar 69-kv line for which copious records were available. Their comparison showed the 345-kv line more susceptible to steep-front strokes; this, coupled with almost double the 69-kv line's stroke frequency rate, closely confirmed the 10 outages per 100 miles per year on the EHV line.

Other model tests by I. B. Johnson and A. J. Schultz, also GE, reveal that voltage rises to crest in about 0.3 microsec on EHV line insulation. Stroke current on single-ground-wire lines must rise 69 kiloamp per microsec vs 88 kiloamp per microamp required with two-ground-wire lines to flash insulators at 3,500 kv.

Lightning current data from various tests show differences which appear to reflect structure height and terminating ground resistance, observed the same authors in another paper. Even though Empire State Building strokes fall short of records made with magnetic links or towers or masts, particularly at heavy currents, 50% of them reach crest in under one microsec. These observations, coupled with inability to account for the high outage rate of EHV lines by the AIEE method, suggest need to modify the method. They suggested expanding it to include steeper fronts, shorter waves, and surge impedance and inductance of the tower, and revising the method for representing the stroke.

But A. R. Hileman and C. F. Wagner asserted that recorded rates of rise are too low to account for the flashovers, suggested that very steep fronts may have been missed in the tests.

Line insulator strings designed for greater-than-normal leakage distances withstand correspondingly higher steep-front waves, said B. E. Kingsbury, GE. He reported improvements of 4 to 12% in impulse strength for 10% gain in leakage distance by using extra units at shorter spacing or fog-type units.

Additional confirmation of close-coupled insulation was provided by A. F. Rohlfs and H. E. Fiegel, also of GE, in their tests of 18-unit strings. And J. H. Hagenguth in discussion claimed that replacing 18 conventional units with 21 shorter ones could cut outages up to 40%.

Fuel Cost Cut by Linear Programming of Generation

- **Large savings claimed for incremental analyses**
- **Nuclear plant data expected from Argonne EBWR**
- **Debate continues on transfer of powerplant auxiliaries**

Reducing fuel costs through linear programming, incremental loading, studying the incremental cost of fuel and its heating value, and recognizing the incremental cost of maintenance, received extensive attention. Some engineers claimed appreciable savings by use of various modern techniques. But M. J. Steinberg, Consolidated Edison, questioned whether variation in turbo-generator performance, depending as it does on overhaul schedules and the condition of turbine and boiler, is enough to offset calculated savings. He also suggested that daily loads come on so rapidly that the chief consideration is to get units on the line. F. H. Light, Philadelphia Electric, disagreed, suggesting that computers can help load dispatching in rapid-load-change periods.

Linear programming techniques used on the Duquesne Light system to determine the proper quantities of fuel to be used from differ-

ent sources were described by A. P. Hayward. He estimated annual savings at $20,000. But changing plant requirements alter the coal flow which in effect pushes the problem back to "cut and try" solution with linear programming in each step.

Savings estimated at $50,000 per year are realized by Southwestern Public Service Co through optimum scheduling of generator operation based on automatic digital computer solutions for scheduling problems, said J. R. Wilson, General Electric. This conclusion was based on a study of two typical days, one in 1952 before loads were scheduled from digital computer solutions, the other in 1954 using the computer.

Generator load scheduling was facilitated by tests to determine the incremental heat rate of each unit, said R. W. Thomas, Southwestern Public Service Co.

Basic data for load schedules on the Philadelphia Electric system are obtained by developing cost curves rather than heat rate curves, said F. H. Light. Elements are fuel, maintenance, labor, and miscellaneouse supplies and expenses.

Debate Auxiliary Transfer

Panel discussion of transferring steam station auxiliaries after loss of the generator from which auxiliaries are normally supplied revealed sharp disagreements with regard to:

1. The desirability of restoring the main generator to normal as soon as possible for accidental trip out.

2. The possibility of damaging motors by automatic, highspeed transfer.

Panel members were: J. F. Allen, Jackson and Moreland; J. G. Noest, Consolidated Edison; R. L. Boyd, Sargent & Lundy; H. A. Thompson, Duquesne Light; W. S. Morgan, American G&E and C. F. Paulus, Cleveland Electric Illuminating Co. Some questioned whether the main generator would be restored to service immediately anyway if it was tripped accidentally. Others thought damage to auxiliary motors would be negligible if the transfer is made only when required by operating conditions and not as a regular procedure for test purposes.

Another question was whether auxiliaries are needed for safe shutdown of the unit. Noest, Consolidated Edison, maintained that auxiliary power is not required for safe shutdown. He also saw no need for auxiliary power to make a hot start-up. But Paulus said selective transfer became essential when the industry went to unitized design.

AUXILIARY THROWOVER in power plants discussed by J. G. Noest, Con Ed

J. C. Woods said Commonwealth Edison has developed a scheme that has the advantages of automatic transfer and avoids its objections. Auxiliary supply is divided between three sources. The bus is broken into four sections. Needed auxiliaries are carried during shutdown. Any two transformers can divide the load equally.

The principle product of Argonne National Laboratory's experimental boiling water reactor will be the test data obtained from it, reported J. M. Harrer. The next step will be operation of the reactor with forced circulation. Operation with heavy water is still a little way off.

The reactor has been in operation nine months, four of them at full power. During this period work around radio-activity has become pretty routine, Harrer indicated. The first maintenance job involved repairing feed pump motors inside the steel containment shell with the plant in operation.

The Argonne reactor requires controls that keep pressure variations to a minimum, reported D. C. McClintock, Sargent & Lundy. This is accomplished by by-passing the turbine with 5% of the steam. All of the steam can be diverted to the condenser, he added.

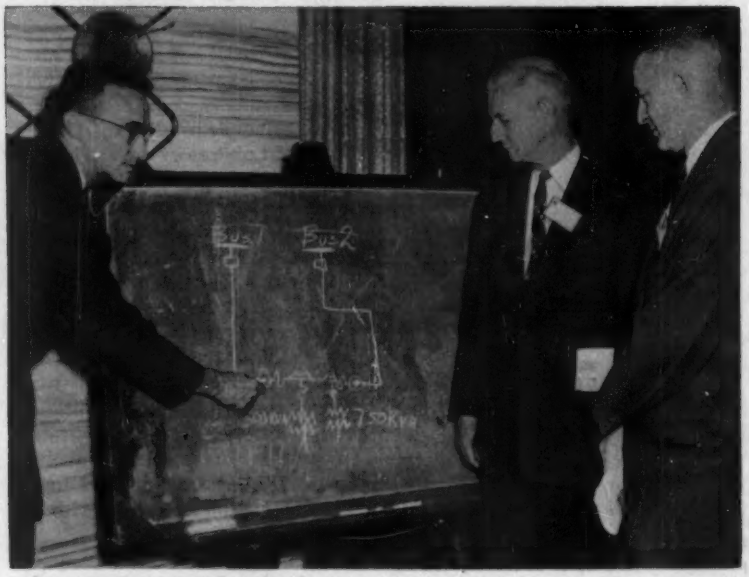
The flow cycle of the EBWR is simple but operating conditions are special, said C. H. Morris, of Allis-Chalmers. The steam is saturated and radioactive. Planned future operation with heavy water calls for tight sealing, he said.

Spot Networks Prove In for Shopping Center Distribution

- **Soaring loads boost continuity requirements, justify use of higher supply voltage or on-site substations**
- **Functional testing offers savings in transformer use**

Residential area shopping centers, with loads up to 12,000 kw for stores, heating plants, and parking lot lighting, call for extensive and varied distribution planning. Architectural treatment and customer access to all sides often preclude use of overhead construction. The magnitude of loads calls for multiple-circuit supply, according to a symposium on shopping centers.

One 4,000-kw establishment cited as typical by W. R. Zimmerman, Commonwealth Edison Co, has four double-unit spot network vaults. Transformers rated 1,000 kva each supply the 277/480-v underground secondary mains. Two large stores and the central power house take service at this voltage but 11 auto-transformers step down to 120/208 v for smaller loads. Power supply is by cable dips from an adjacent 34.5-kv open-wire tie circuit split by an automatic sectionalizing circuit breaker to serve in



SHOPPING CENTER SERVICE is explained by W. R. Zimmerman, Commonwealth Edison, to R. C. Daffron, Virginia E&P, and R. M. Grogan, Long Island Lighting

emergency as two feeds. This supply was selected in preference to reinforcing the adjacent 4-kv primary network.

Where space permits pole-mounted transformers, the system can be more economical. Zimmerman described one installation which uses 6 platforms supporting 500- or 750-kva 3-phase transformers to serve a 2,500-kva load. Service voltage here is 120/208 to each store. Supply is a 12-kv loop manually switched at each transformer.

Spot networks were selected by Long Island Lighting Co to serve an 11,000-kw shopping center, reported R. M. Grogan. Four-unit vaults were provided at five locations and an eight-unit vault in the central department store. Transformers comprise 16 1,000-kva and 12 500-kva network units, supplied from 4 13.2-kv primary cables.

Centers Served Underground

Virginia Electric & Power Co also has to use underground distribution for large shopping centers, said R. C. Daffron. The largest of these, with a 3,200-kw demand, is served by 4 network vaults with two 1,000-kva units in each, in addition to a 1,500-kva transformer in the power plant and 500 kva in a supermarket. Service is at 120/208 v except in the power plant and one network vault which have 277/480 v. Primary supply is from an automatically split 23-kv tie line.

Most stores in 13 shopping centers in the Detroit area get 120/240-v, 3-phase, 4-wire service, reported W. E. Groves. Primary service for all is 4,800-v 3-phase but larger loads are served directly at that voltage. But the largest center's 8,500-kw required a 20-Mva distribution substation on the site.

Seek Transformer Savings

Functional testing offers utilities an opportunity for substantial savings in transformer operation, said A. M. Lockie, Westinghouse. Already results have shown that loading today's transformers according to the ASA Guide gives up to 100 times the life expectancy assumed in the Guide. This gain has substantially aided utilities confronted with unexpected load peaks and given greater latitude in loading transformers for economy, he said.

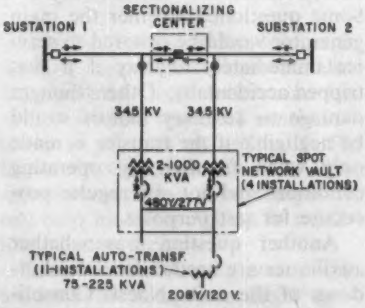
The prevailing method of protecting substations without installing fuses or breakers is to depend upon a source relay, said G. D. Rockefeller, Westinghouse. But the source relay is not sufficiently sensitive to protect for turn-to-turn faults, he added. Therefore a carrier channel or grounding switch is essential for protection against an internal fault.

Two installations on the Oklahoma G&E system have substation transformer protected with source relays and breakers instead of high side breakers or fuses, said G. E. Taylor. Economic considerations prompted omission of high side breakers at substations.

E. C. Rankin, Appalachian Electric Power, described a motor-reopening, spring-closing grounding switch arrangment which provides protection for transformer faults.

A high-speed grounding switch interlocked with a motor-operated disconnect is one method used by Commonwealth Edison Co, said P. M. Black. He said the arrangement used depends largely on whether the object is to protect substation equipment or to protect the system. The protective scheme used also depends on the facilities available, the speed of isolation required, and what other equipment will be removed from service.

Substation troubles account for only a small percentage of total customer interruption time but improving their relaying sensitivity and clearing speed for distribution faults, coupled with fast reclosing, offers promise of considerable improvement in distribution service continuity. Recognition of these relationships, supported by analysis of interruption records, encourages more extensive use of simplified substation circuitry with few normally-open circuit breakers or transfer switches, even for distribution substations up to 30 Mva and larger. These conclusions are from a panel discussion among E. F. DeTurk of Long Island Lighting, Arthur Gothberg of Public Service Electric & Gas, Y. L. Hughes of Gulf States Utilities, N. G. Larson of Commonwealth Edison, and Elwood Zavitz of Detroit Edison.



DUAL-FEED SPOT NETWORKS help Commonwealth Edison serve Hillside

High Frequency Expands for Industrial Tools, Lighting

- Tool speed, lighting efficiency gain from cycle boost
- System design follows 60 cps principles

Advantages gained in powering industrial heating equipment, high frequency tools and fluorescent lighting is prompting increased use of higher frequencies, 400 to 20,000 cycles, for industrial power purposes, W. A. Munson of Westinghouse Electric Corp told the Industrial Power Systems session. Tools are faster and fluorescent lighting efficiency is higher when used at higher frequencies. Weight of ballasts is reduced.

Munson used the installation at Ladish Co forge plant as an example. This system has two 3,600-cycle, 4,800-volt, 1,750-kw generators and a third is being designed to parallel with them. Transmission at these high frequencies presents special problems. Reactance and conductor design must be given special attention. The paper presented by Munson includes data and information to enable engineers to design a high-frequency transmission system.

In a paper on dc power for industrial applications, Munson said that present supply for dc loads is chiefly from motor generator sets and mercury arc rectifiers. The rectifier has the advantages of higher efficiency, reduced maintenance, lower installation costs, inherent overload characteristics and it is instantly available and comparatively noiseless. Disadvantages of rectifiers are: they will not transmit reverse power; and they will not operate at leading power factor.

High Power Rectifiers for Dc

The motor-generator set usually offer the advantage that output voltage is not subject to input voltage variations. The future, said Munson, will see wide-spread use of semi-conductor rectifiers such as germanium and silicon. They offer the possibility of larger rated power sources from physically smaller units.

Industrial power systems of 400 cycles use the same principles as 60 cycle systems, said D. L. Johnson of General Electric Co. This frequency is used extensively around aircraft hangers and on landing strips because practically all new planes use 400 cycles.

For large systems the supply should be located near the load. For smaller systems, up to 500 or 750 kva, it is practical to transmit the 400 cycle power. Circuit breaker characteristics are different at 400 cycles from those at 60 cycles. Wire and cable should not be in steel conduit or have magnetic sheath except for small conductors, No. 13 and smaller.

Design of a 400 cycle system should not be any more difficult than the design of a 60 cycle system. But, design data is not as readily available.

Reliability is the important factor in industrial distribution systems, D. Dalasta of Allis-Chalmers Mfg Co told the group. To check reliability, it is necessary to look at the system as a whole, not just the components. Physical testing, while desirable in some respects, is expensive and time consuming and may cause service interruptions. Therefore, for involved systems, the analog computer is used to determine system adequacy. Tests are made to check short circuit conditions, solve load flow problems, analyze stability, determine the effect of motor starting and other load swings, and choose the grounding practice.

MD's Urge Mouth-to-Mouth Resuscitation in First Aid

- Rate push-pull methods second choice, prefer mechanical devices, but frown on defibrillator; stress prompt treatment

Mouth-to-mouth insufflation was urged for resuscitation of electric shock, gas, and drowning victims by Doctors A. S. Gordon and C. W. Frye of University of Illinois. Advantage of this method, they said, is its assurance of an effective supply of oxygen, particularly because the rescuer has direct indication of the inflation of the victim's lungs and, is in position to relieve airway obstructions when they occur. They suggested that the method might be useful even for pole-top use.

Push-pull manual methods are the second choice of resuscitation methods, they said, but one method or the other must be started promptly and continued until mechanical devices can be rigged to simulate natural breathing. Units activated by timing mechanisms give the desired rapid inspiration followed by a sudden expiration of air from the lungs.

Use of mechanical resuscitators by utility crews was advocated by T. M. C. Martin, University of California, particularly for cases where cessation of breathing is complicated by other injuries. But he also stressed the desirability of starting manual treatment immediately and continuing it until the mechanical device can take over.

Cardiac resuscitation was brushed off by Dr. Gordon as "illogical and dangerous" for field use because of need for medical skill. But Dr. Kouwenhoven, Johns Hopkins University, contended that accident victims could not wait for resuscitation by people with medical training. He cited successful use of his externally applied defibillator for hospital cases as encouraging the development of similar equipment for field use by utility personnel with first-aid training.

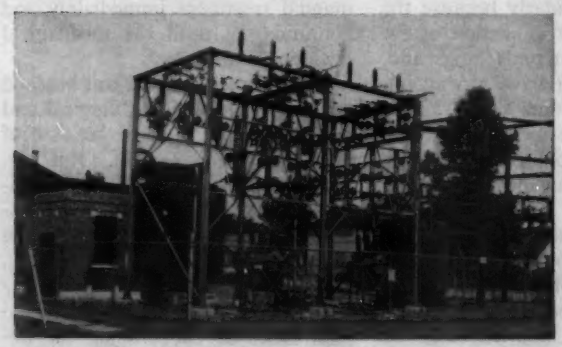
Windsor (Ont.) Commission dresses up new facilities to make . . .

Substations Match Surroundings

Cost of Prince Road-Gary Substation

Ranch-type building	$15,000*
Metalclad, indoor, low-voltage automatic switchgear	25,000
Power transformer, fan-cooled	21,000
Labor, landscaping, fixtures	9,000
Total	**$70,000**

*Exclusive of land



OLD OPEN-TYPE SUBSTATIONS like this in residential and commercial areas are converted to contemporary buildings when heavily-loaded equipment is replaced to meet needs

Residential and commercial distribution substations are given a complete "face-lifting" by Windsor (Ont.) Utilities Commission as facilities are enlarged or replaced. This is part of the commission's program to make substations attractive and congenial in the community.

The new substation equipment is housed in a building whose appearance matches the particular residential or business area. A new 12,000-kva substation in a residential area is housed in a brick-faced concrete-block ranch-type building. In downtown Windsor, a commercial-type building is used.

The commission plans to complete five new substations before the end of the year. Replacement of other open-bank, exposed-transformer substations will continue as equipment becomes obsolete and loads grow. Costs of new substations vary according to the type of building. One new residential substation cost $70,000, exclusive of land.

At this old outdoor-bank substation, a 1,500-kw, 25-cps and a 2,000-kw, 25-cps combination were replaced by a 6,667-kw, 60-cps transformer and a 25-cps unit rewound for a 4,500-kw rating. Some stations have facilities for a second transformer to provide for load growth.

Construction forces were supplemented whenever possible by line and construction crews of the commission as overhead distribution lines still are used extensively in the Windsor area. The new substations have incoming and outgoing lines underground. Facilities are included for line-crew lunchrooms. The unattended substations are monitored by a central alarm system at the main substation.

Relays Prevent System Shutdowns

Application of underfrequency relays speeds load recovery during major system disturbances and provides maximum continuity of service

C. W. COGBURN, Section Head—Relay,
G. C. KELLEY, Field Engineer, General Engineering Dept, Florida Power & Light Co, Miami, Fla.

Underfrequency relays are installed by Florida Power & Light Co to maximize service continuity by preventing complete system shutdowns during major disturbances and speeding load recovery. The relays are applied to generating plants, intra-system ties, and substations.

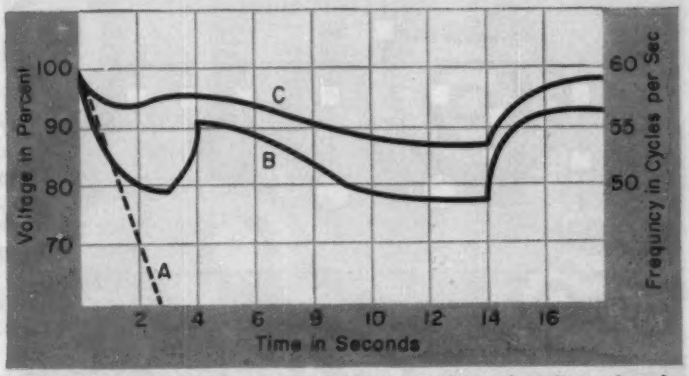
These relays are set to operate breakers during severe underfrequency conditions. Three settings were established in accordance with priorities for service continuity. Highest priority goes to lines supplying hospitals, water pumping stations, etc. When a feeder is opened by underfrequency relaying, its breaker is reclosed manually.

Automatic methods for reducing overloads during disturbances were preferred to manual procedures. The method used was selected by determining the greatest rate of frequency change that can result on the system.

Small System Decays Fast

Obviously, a small system with heavy ties and a load about 200% of system generation would be expected to have a faster rate of frequency decay than a large system having a load of 125% of system generation. In the latter case, manual operation may be used when operators can be relied on to reduce generator overloads before the frequency drops to a value unsafe for operation of plant auxiliaries. But manual operation would probably not be fast enough to save the system from complete shutdown during severe overloads. Therefore, automatic load reduction is used.

Automatic operation is applied effectively for both system splitting and load reduction. By considering all factors affecting system stability, automatic equipment protects the system against the most severe overloads. An example of what can be expected is shown in Fig 1. Curve A is a typical system frequency decay, Curves B and C show effect of proper automatic load reduction.



1 PROPER APPLICATION of load reduction reduces the effect of major disturbances on system voltage and frequency. Curve A shows frequency decay of typical system while curves B and C show effect of load reduction

To detect low-frequency conditions and initiate reduction of load, Florida P&L engineers selected an underfrequency relay, which has an overall operating time of about six cycles and the following performance characteristics:

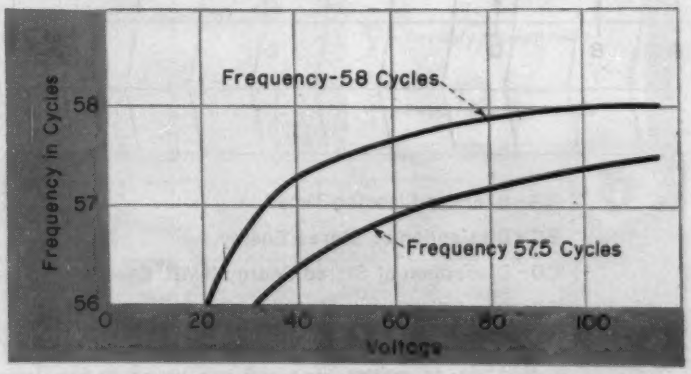
1. The relay operates at the frequency at which it is set and remains in a picked-up position as frequency is decreased to zero and voltage from 120 to 32 to 24.

2. The frequency relay operates to close the "left" contact in one-half to one cycle of time.

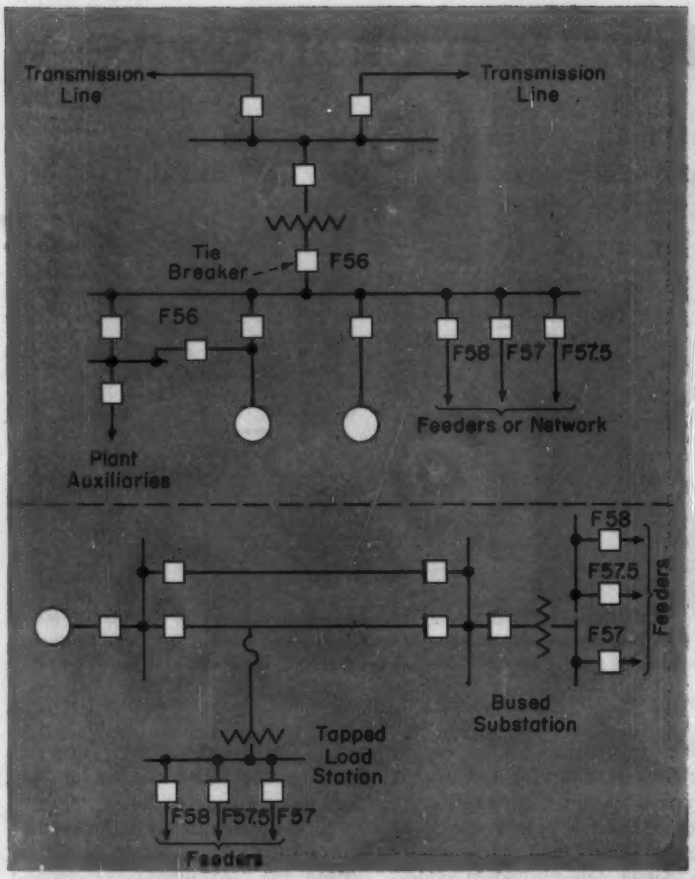
3. If the frequency is reduced to the setting of the relay and then raised, the "left" contact closes and then opens immediately. But the relay will perform its tripping function if the frequency does not return to normal within a predetermined time.

4. The relay has an internal time delay (fixed value), which eliminates the 80% voltage cut-off feature.

The voltage-frequency curve for the relay is shown on Fig 2. This relay is applied to intra-system trans-



2 VOLTAGE-FREQUENCY curve shows the performance characteristics of the underfrequency relay. Two frequency settings of the relay are indicated



3 TYPICAL APPLICATIONS for underfrequency relays are shown in one-line diagrams above. The "F" numbers indicate relay settings that can be used

mission lines, at generating plants, bused substations, and tapped-load substations (see Fig 3). In most of these applications the 6-cycle overall delay provides effective operation, although some substation applications require special attention.

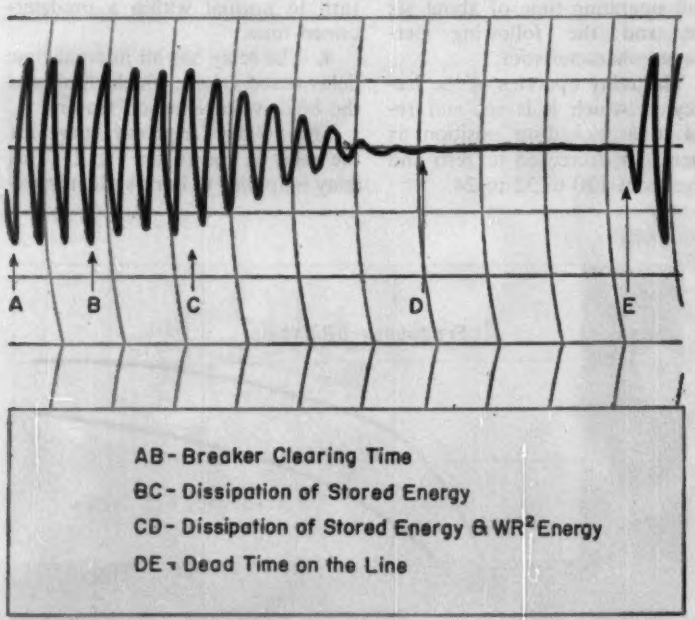
Relays Split Transmission

On transmission lines the underfrequency relays separate one part of the system from another. This function prevents trouble on one part of the system from pulling down other parts. (To prevent a similar situation between systems, impedance-type relays are applied to interconnections).

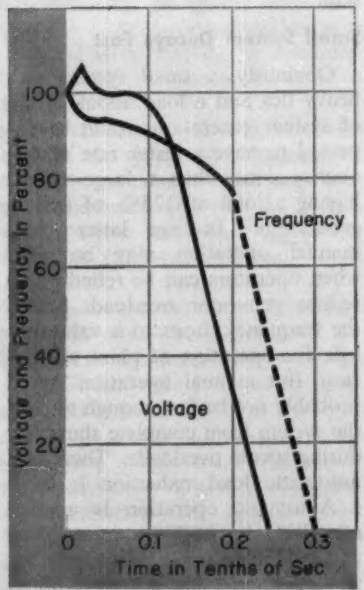
At generating plants during underfrequency conditions the relays separate the generation from transmission, so that the generation supplies a particular load, such as plant auxiliaries, load networks, and distribution feeders. The relays also initiate load shedding and monitor frequency.

At bused substations, underfrequency relays separate the load area from the transmission system and shed load on feeders. At these substations 6-cycle time delays should override most transients.

At tapped-load substations the relays are applied to shed load, the time delay required ranging between



4 STORED ENERGY of typical Florida P&L transmission line requires time between B and D to dissipate. This is considered when setting relays



5 DECAY OF line frequency and voltage for same line as oscillograph, Fig 4

6 and 20 cycles. This range takes into account the capacitance effect or stored energy of the lines, the decay rate of which is shown in Fig 4 for a typical line.

On this oscillograph, the time for the breaker to clear is represented by time "AB." Stored energy is dissipated in time "BC." Dissipation of the remaining stored residual energy and the WR^2 energy of rotating load equipment is shown by the time "CD." "DE" represents the dead time on the line before the transmission breaker was reclosed.

For this same line, decay of voltage and frequency are shown in Fig 5.

To prevent incorrect tripping due to the slow rate of decay of stored energy in a transmission line supplying tapped-load stations, the following methods were examined:

1. Installing underfrequency relays at bused points only and adding transfer trip channels to the tapped-load stations.

2. Using an "extra-sensitive" polyphase directional relay to detect current reversals through the power transformer. This directional unit would supervise the operation of the underfrequency relays.

3. Increasing the time delay to 20 cycles (fixed time) for 125-v dc supply.

Feeder Priorities and Frequency Settings for 500-Mw Area

Priority	Block (Mw)	Relay Frequency Setting (Cps)	% Total Area Mw	No. of Feeders
4	70	58	14	14
3	70	57.5	14	14
2	60	57	12	12
1	300	0	60	60

4. Adding an instantaneous drop-out undervoltage relay (60 cycles) to block tripping below 80% ac voltage.

5. Adding a bridge-type rectifier to supply 125-v dc to the time-delay circuit and adjusting the time delay as follows: 100% voltage, 8 cycles and 80% voltage, 12 cycles.

Fixed Delay Selected

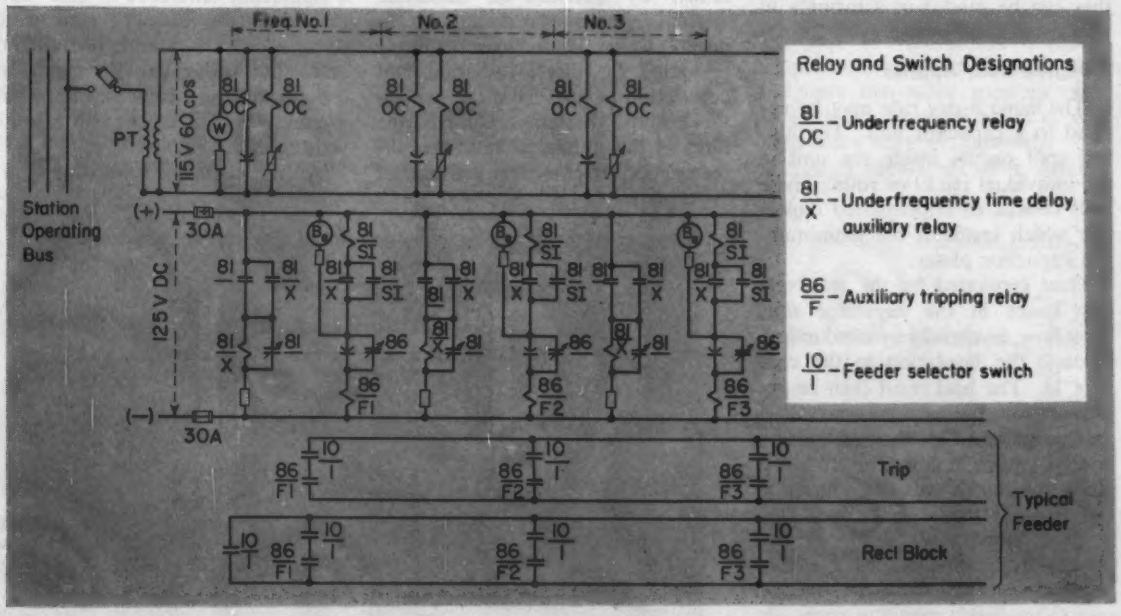
Of these methods the fixed-time delay (No. 3) was selected for its simplicity and because of the unknown variables in the system, such as the rate of voltage decay for a given system disturbance.

In applying underfrequency relays three frequency settings are used: 58, 57.5, and 57 cps. A setting of 56 cps could not be used because it was found to be the lowest frequency for safe operation of plant auxiliaries. A setting of 59 cps was ruled out to avoid conflict with automatic load control of generation.

Frequency settings are assigned to feeders in the reverse order of feeder priority. That is, a feeder serving water pumping stations, hospitals, and special government services gets highest priority and, therefore, the lowest frequency setting.

To show how blocks of load were selected for the priority ratings, assume a load area of 100 5-Mw feeders having 500 Mw of generation, the largest unit of which is 200 Mw. In this area the most severe disturbance would be caused by loss of the 200-Mw unit. Therefore, about 200 Mw of load is divided equally among the three frequency

(*Continued on page* 124)



6 ELEMENTARY DIAGRAM shows a feeder tripping and re-change the frequency setting of given feeder. Control closure blocking circuit. Selector switches are used topanels are designed to accommodate maximum of 10 feeders

How to Apply 50-Kvar Capacitors

Normal life of these equipments can be attained in vaults by taking special precautions in the design and operation

N. M. NEAGLE, Specialist, Product Planning;
H. M. GRAHAM, Development Engineer, Capacitor Department, General Electric Co, Hudson Falls, N. Y.

Equipments with primary 50-kvar capacitors can be applied underground successfully — and without appreciably shortening their life expectancy. Extensive laboratory and field tests have proved that the unusual thermal and design problems encountered in vault installations can be solved by special design and operation precautions.

The service expected from hermetically sealed, insulated electrical equipment is related not only to the operating voltage, but to the maximum internal (dielectric) temperature of the equipment. Assuming constant voltage, tests and experience have led to development of the "8-degree rule." This rule states that for each 8-deg rise in hot-spot temperature, insulation life is reduced one-half. This is only an application guide, not a precise rule that can be placed in a formula to obtain an exact answer.

8-Degree Rule Applies

The same 8-deg rule may be applied to a capacitor unit. The hottest spot occurs inside the unit in the individual packs or rolls. These rolls consist of impregnated dielectric which insulates the aluminum-foil capacitor plates.

Heat generated by the relatively low losses in the capacitor rolls must flow, essentially by conduction, through the insulation to the case (Fig 1). The heat must then be removed from the case by convection and radiation. This flow of thermal energy causes a temperature drop from the inside of the capacitor roll to the outside of the case.

This temperature drop—or, as viewed from outside the case, this temperature rise, from the outside case to the inside capacitor pack—is important. Under usual operating conditions, the temperature rise from case to the inside of the capacitor roll is nearly constant. Thus, the maximum internal temperature is directly affected by the outside air temperature surrounding the capacitor case.

In an application where air circulation is likely to be restricted, excessive internal temperature under normal excitation is frequently a limiting condition. The heating problem is further complicated where heat exchange to the surrounding atmosphere is reduced by installing the equipment in wooden or concrete vaults sunk in dry soil.

To develop rules guiding the application of 50-kvar capacitors underground, heat runs were conducted in both laboratory and field.

The laboratory tests, conducted indoors in a controlled ambient, were not complicated by the effects of the sun. All heat generated in the simulated lab vault was removed by convection and radiation into a sink of constant ambient. The thermal characteristics were obtained by barriers of negligible thermal capacity surrounding the capacitor bank. These barriers merely restricted the direct radiation and convection of heat from the capacitors. Thus, the temperature of the units in the simulated vault was directly tied to the temperature of ambient air surrounding the vault.

This is not true for an actual vault. The surrounding earth has considerable thermal capacity which affects the daily cycle of vault ambient experienced by the capacitors.

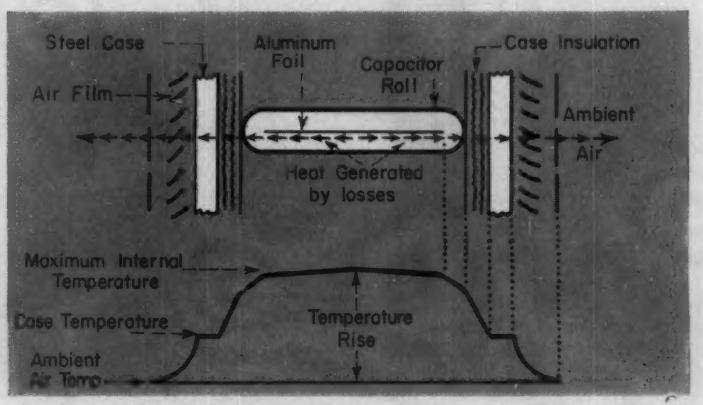
To check this application, a simulated vault large enough to hold three 50-kvar capacitors was made, using a 2-by-4 framework covered on both sides with reflective insulating paper. The open top was covered with expanded metal screen having about 60% opening factor.

This construction forced the heat generated in the vault to be removed mainly by convection through the grates, whereas the walls and floor of an underground vault would normally transmit a portion of the heat to the earth. With the same outside air temperature, the maximum temperature in an actual underground vault tends to approach, but be less than, the temperature encountered in the simulated vault.

Vault Mockup Checks Design

A comparative heat run for 50-kvar capacitors on an open-air rack and in the mocked-up vault revealed a significant difference in case temperatures (Fig 2). The runs were made indoors to eliminate sunlight, and the controlled air ambient around rack and vault was approximately 45C. The capacitor units were spaced 3 in. apart.

As the capacitor's maximum in-



1 HEAT GENERATED by losses in capacitor rolls flows by conduction through insulation to the case to be removed by convection and radiation

Underground Successfully

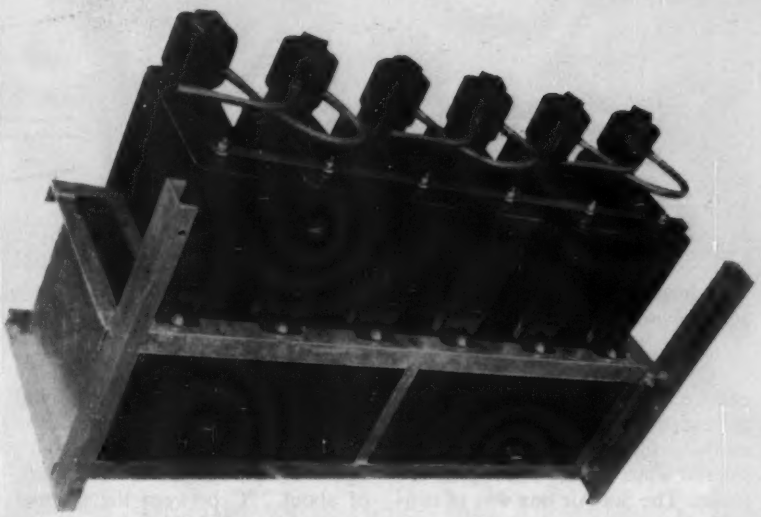
ternal temperature under normal operating conditions is nearly a constant rise over the case temperature, both are considerably higher for the simulated vault than for the open rack. Applying the 8-deg rule makes it obvious that capacitors in this simulated vault would have shorter life at any given voltage than those in an open-air rack.

A study was made of the effect of restricted circulation on operating temperatures of 50-kvar capacitors (Fig 3). Case temperatures were lowest for open racks, highest in the simulated vault with natural circulation, and intermediate with a small blower furnishing about 400 cfm of air through a 4-in. inlet near the bottom of the vault.

These tests indicated that forced ventilation lengthens the life of a capacitor in a vault by lowering the maximum internal temperature. Although the controlled air ambient of 45C may be high for actual installations, a cooler ambient would not appreciably change the relationship between the different capacitor temperature curves.

Results of the lab tests indicated that a successful vault application must consider the higher temperatures resulting from restricted air circulation, and that adequate measures should be taken to assure best possible ventilation.

The field test was made on a 300-kvar equipment containing six 50-kvar, 2,400-v units in a shallow sidewalk vault. The vault roof was completely covered by a heavy grate. Temperature was measured at six points (Fig 4) and plotted for a typical summer day (Fig 5).

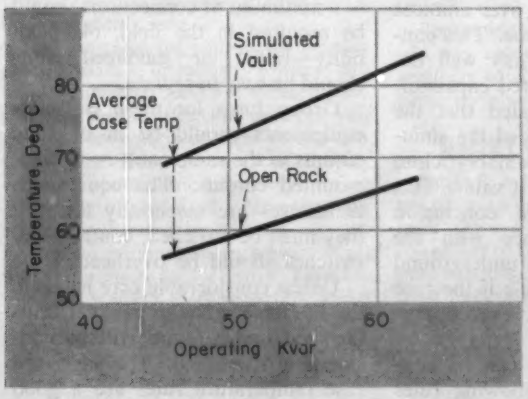


300-KVAR CAPACITOR EQUIPMENT for 4.16-kv wye-grounded circuit requires only 3 connections to leaded cables. Each cable leads to compound-filled water-tight terminal chamber covering bushing on 2,400-v 50-kvar unit. Neutral connection is by copper bus connecting all ground studs to galvanized rack. Connector on copper bus grounds rack and neutral

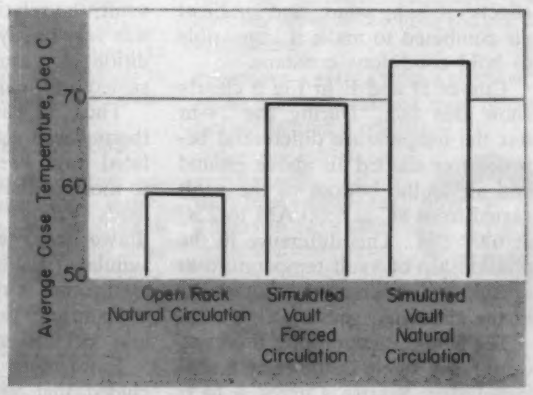
Highest temperatures were recorded on a capacitor case exposed to sunlight (Curve A of Fig 5) and on a shaded side of a unit in the center of the bank (B). The air temperatures just under the grating near the center of the bank (C) and near the bottom of the vault (D) were lower. Lowest were the shaded-air ambient measured about 20 ft up an adjacent pole (E) and average Sol-Air temperature F.

The Sol-Air unit measured the average of the temperatures of the top and four sides of a small box. The dip in Sol-Air temperature around noon resulted from the fact that only two sides were exposed to sunshine. At other times of day three sides were illuminated.

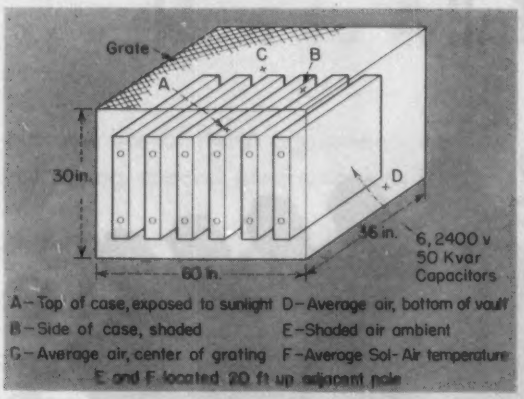
Curve A shows a rather striking



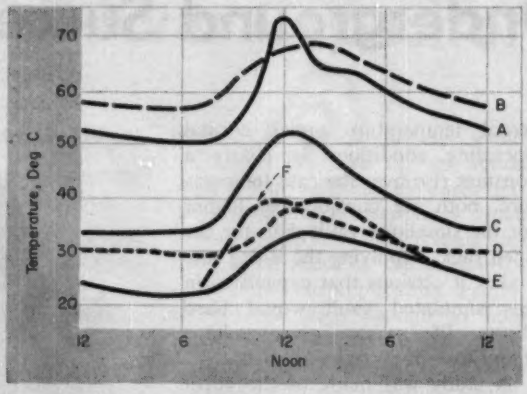
2 DIFFERENCE in case temperature was revealed by comparative heat run for units in rack and in vault



3 FORCED CIRCULATION lowers the case temperature of a 50-kvar capacitor in a simulated vault installation



4 TEMPERATURE WAS READ at 6 points in field test of 300-kvar equipment in a shallow sidewalk vault



5 TEMPERATURE READINGS at 6 points were plotted for summer day. Curve A shows effect of the sun's rays

effect of sunlight on the temperature of exposed surfaces of capacitor units—a factor which must be considered when outdoor heat runs are made. The Sol-Air box was of considerable assistance in factoring the effects of wind and solar radiation. In this particular instance, with the capacitor equipment sunk in a vault covered by a heavy grating, the beneficial effect of surface winds was largely lost.

In comparing data from the simulated vault (Fig 2) and the actual field vault (Fig 5) it is important to realize that conditions were somewhat different. Tests on the simulated vault were made indoors under controlled conditions, and the temperature of the capacitors could be related directly to the temperature of surrounding air.

Field Conditions Vary

For the field vault, conditions changed with time. The thermal capacity of the earth and the varying effects of sun, wind, and ambient air combined to make it impossible to hold conditions constant.

Curves D and E in Fig 5 clearly show this fact. During the 24-hr test the temperature differential between free shaded air above ground and air at the bottom of the vault varied from 8C at 6:00 AM to 25C at 6:00 PM. This difference in the relationship of vault temperature to outside air ambient did not occur in the simulated vault.

The field-test conditions, however, were fairly stable in the early morning. Before sunrise, Curves A to E showed a somewhat constant temperature, and the differential between case temperature (B) and temperature of air at bottom of the vault (D) was about 27C. This figure compared with the difference of about 27C between the internal surface of the simulated vault and average case temperature (Fig 2).

In the simulated vault the internal surface temperature was about 48C, 3C higher than outside air ambient, and the average case temperature was about 75C at 52 and 53 kvar (with rated voltage on capacitors). This difference, 75C minus 48C, is 27C—the same found in the field vault during fairly constant operating conditions.

From the heat runs in the simulated vault it was predicted that temperature rise of the case over the air temperature in the bottom of the field vault would be 28 to 30C at rated voltage. Curves B and D agree with this prediction.

Although the overall temperatures in the field vault were 10 to 15C lower than in the simulated vault, the relative rise over ambient was very nearly the same. This condition is normal for any well designed and manufactured capacitor.

Thus, it was indicated that the thermal characteristics of the simulated vault were reasonably close to those of the field test vault. This lends validity to the conclusion drawn from experience with the simulated vault—that underground application is reasonable if the case temperature does not exceed certain specified values.

From these tests it can be concluded that, if the following rules are adhered to, a successful vault application may be made:

- The capacitor case temperature must not exceed 70C at rated voltage and 65C at 110% rated voltage when measured at a point not in direct sunlight on one of the larger sides, 4 to 5 in. below the uppermost surface and at least 4 in. from either end. These operating conditions describe the maximum temperatures to be allowed on the case; average daily case temperatures should be 10C lower.
- The case temperature must be reduced when it exceeds the above values. Switching the capacitors off during light load or adding forced ventilation helps.

Design Reflects Vault Needs

General requirements for capacitor equipments for vault applications are: (1) safety—all live electrical parts should be protected by a grounded metal or lead sheath; (2) submersibility—the equipment should operate successfully when submerged; (3) ease of installation—a minimum of connections should be required in the field; (4) flexibility—failed or damaged units should be easy to replace.

Group fuses for these capacitor equipments should be in oil-filled cutouts in the same vault or in pole-mounted cutouts. The equipments themselves are essentially fixed; if they must be switched, controls and switches should be overhead.

Unless considerable care is taken, the life expectancy of 50-kvar units installed underground will be considerably shortened. The suggested case temperature rules are a good guide. In all cases, the best possible supply of air should be provided.

APPLIED RESEARCH "Demonstration streets" at General Electric's Hendersonville, N.C., plant permit study of lighting problems on all classes of streets, under all light sources, and for different pavements. Here, Justin Peterson, manager of advance engineering, supervises a light measurement reading of a mercury vapor system on the "main business" street.

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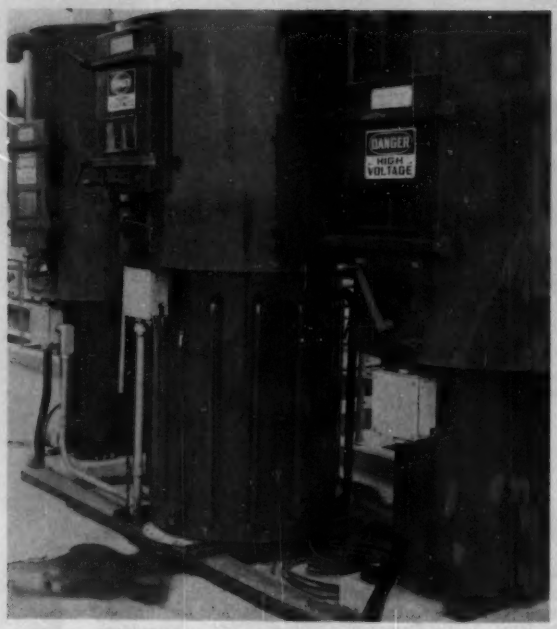
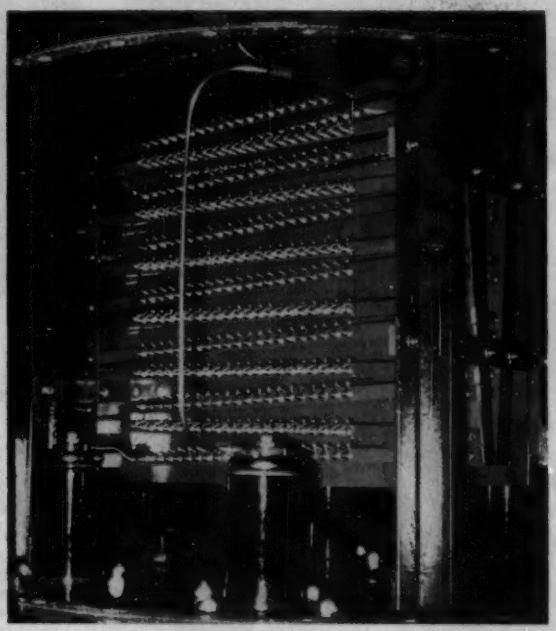
VISION-ENGINEERED STREET LIGHTING SYSTEMS

GENERAL ELECTRIC



TEST UNIT of silicon rectifier is rated 30 kva. It is flanked by conventional units at the new NYSE&G Milliken station



SILICON RECTIFIER cells assembled in series on a frame are immersed in oil with the power-supply step-up transformer

GENERATION—Design

Silicon Good for High-Voltage Rectifiers

R. E. **WILLISON**, Manager, Development Engineering Dept., Research-Cottrell, Bound Brook, N. J.

Tests indicate satisfactory performance of a new oil-immersed silicon rectifier as part of the power supply facilities for electrostatic precipitators. The tests were at the new Milliken Station of New York State Electric & Gas Corp.

This pilot installation was part of a program for improving rectifier performance to a level consistent with that made possible by recent introduction of automatic precipitator electrical control systems.

As a result of this successful pilot installation, commercial silicon rectifier sets are being manufactured for several new precipitators. Included is one at a power plant precipitator that will be used to clean 1,200,000 cfm of flue gas at 275F with an efficiency of 96.5%.

Basically, an electrostatic precipitator consists of a discharge and a collecting electrode. Collecting electrodes are permanently grounded; the discharge electrodes are negatively charged at 15,000 to 100,000 v or more. The electrical field produced between the electrodes negatively charges the solid particles in the gas stream passing through it. These particles are attracted to the grounded collecting electrodes, where they give up their charge and are removed.

Has These Basic Elements

The basic elements of the power supply equipment for the precipitator are the control unit, the transformer for changing incoming low-voltage ac supply to the high voltage required for precipitation, and the rectifier for changing this ac to dc used in the precipitator.

General requirements for precipitator rectifier equipment are adequate voltage and current capacity, high reliability, operation with heavy sparking on the discharge electrode, and long life. Operating conditions are quite severe because some sparking between the electrodes is generally considered to be desirable in most installations.

Industrial-type silicon rectifiers now available have a peak inverse voltage rating of cell of 300 to 400 v per cell. Development in progress may raise this figure to 600 to 1,000 v. Average dc current density is about 1,300 amp per sq in. Silicon rectifiers have efficiencies over 97% and can operate in ambient temperatures up to 150C. Actual service life is as yet unknown.

Silicon is excellent as a rectifier element because it is small and adaptable to hermetic-sealing construction. Increase forward voltage drop due to aging is negligible.

The rectifier at the Milliken station consists of silicon rectifier cells assembled in series on a frame and immersed in oil with the step-up transformer normally used with the electrical system of the percipitator. It is rated for an output of 70 kv peak and 500 ma average dc.

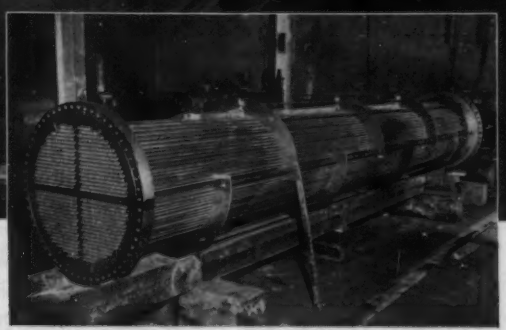
Get your feed water heaters off to a good start

. . . *tube with REVERE*

Since no single alloy will be most reliable and economical under all various conditions encountered, the wealth of knowledge accumulated through Revere's Research Department is of vital importance to you.

For, over the years these specialists have compiled extensive data regarding the relative corrosion resistance of the different alloys under a wide variety of operating conditions. Why not take advantage of this storehouse of facts and consult with Revere's Technical Advisory Service before selecting the tubes for your equipment?

Revere also furnishes plates, from the smallest to the largest sizes, in Cupro-Nickel, Copper, Herculoy, Muntz Metal, Naval Brass and Admiralty, and tubes in Cupro-Nickel, Aluminum Brass, Admiralty, Herculoy, Arsenical Copper, Muntz Metal and other alloys.



REVERE 70/30 and 80/20 CUPRO-NICKEL tubes were used in high and low pressure feed water heaters designed and fabricated by CONDENSER SERVICE & ENGINEERING CORP., Hoboken, N. J., for Kent Avenue Station of the New York City Transit Authority.

REVERE COPPER AND BRASS INCORPORATED

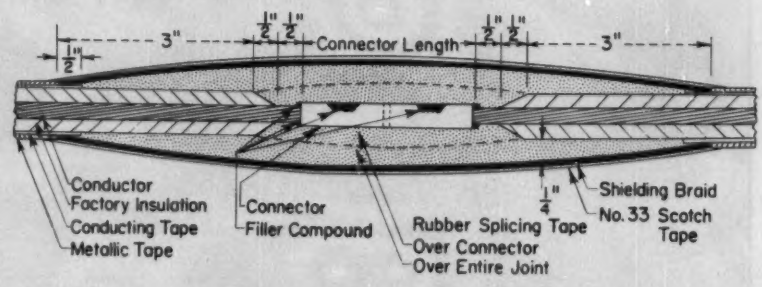
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

Making Straight Joints on Aerial Cable

Procedures are outlined for making straight joints of both the shielded type and non-shielded type on 5-kv preassembled aerial cable. These are adapted from Distribution Standards of New England Electric System

Procedure for Shielded Type Cable



1. Unwrap Binding Tape; fasten to messenger with fasteners 12 in. each side of center of joint and remove surplus tape.

2. Unwrap Metal Tape proper distance. CAUTION: Do not cut any outer layer by pressure toward cable insulation. Slip sharp blade beneath lapped edge of metal tape and cut away from insulation. Cut metal on bias and make edges smooth and flat; remove burrs.

3. Strip Conducting Tape to within ½ in. of metal tape.

4. Pencil Factory Insulation at cable end. Finish smoothly.

5. Install Proper Connector and secure with compression tool. File burrs or sharp edges after connection is made.

6. Clean Exposed Factory Insulation with benzine.

7. Roughen All Exposed Surfaces of factory insulation with smooth rasp (shoemakers') and apply coating of rubber cement, allowing to dry until it becomes tacky.

8. Fill All Indents and Voids with filler compound.

9. Start Splicing-Tape Procedure at bottom of penciling with overlapping wraps across connector; taping to be extended over penciled ends of cable insulation until flush with factory insulation. Use rubber splicing tape.

10. Build Up Insulation by applying half-lapped rubber splicing tape evenly over entire joint to dimensions shown. Tape shall be wrapped so as to build up an extra layer of insulation over connector.

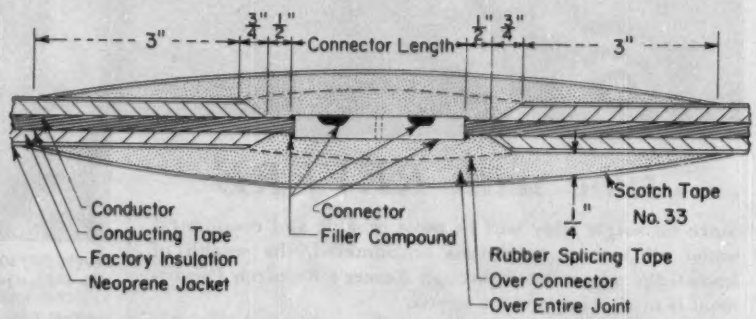
11. Apply Half-Lapped Metallic Fabric Shielding Tape to cover completely entire joint and sweat ends of metallic tapes together.

12. Apply Two Layers of Half-Lapped No. 33 Scotch Tape over entire joint.

13. Support Joint with Cable Supporting Bands, installed approximately 1½ in. from ends of joint and secured to messenger.

14. Applying Tape; do not stretch ¾ in. tape to less than ½ in. and 1 in. to less than ¾ in. width

Procedure for Non-Shielded Type Cable



1. Unwrap Binding Tape; fasten to messenger with fasteners 12 in. each side of center of joint and remove surplus tape.

2. Pencil Factory Insulation at cable end. Finish smoothly.

3. Install Proper Connector and secure with compression tool. File burrs or sharp edges after connection is made.

4. Clean Exposed Factory Insulation with benzine.

5. Roughen All Exposed Surfaces of Neoprene jacket and factory insulation with smooth rasp (shoemakers') and apply coating of rubber cement, allowing to dry until tacky.

6. Fill All Indents and Voids with filler compound.

7. Start Splicing-Tape Procedure at bottom of penciling with overlapping wraps across connector; taping to be extended over penciled ends of cable insulation until flush with factory insulation. Use rubber splicing tape.

8. Build Up Insulation by applying half-lapped rubber splicing tape, evenly over entire joint to dimensions shown. Tape shall be wrapped so as to build up an extra layer or insulation over connector.

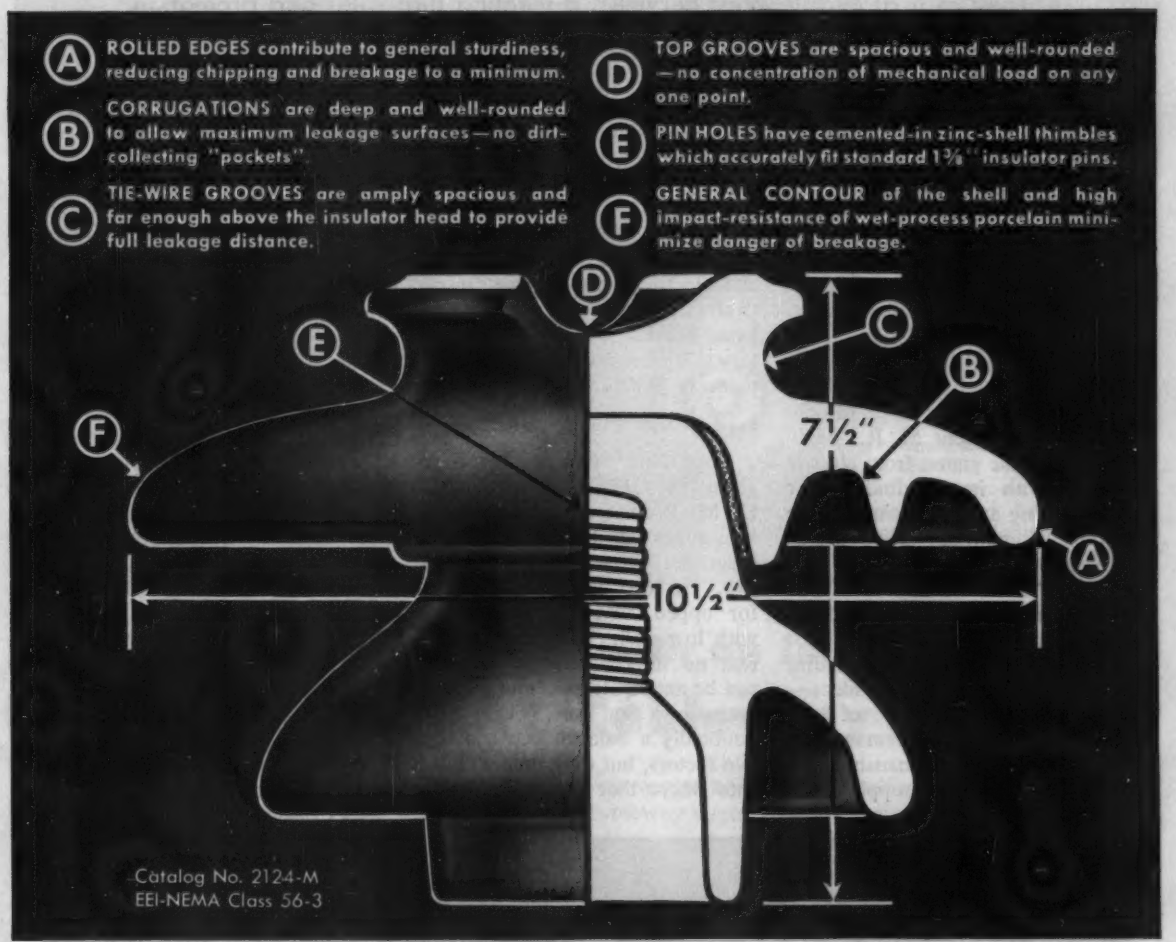
9. Apply Two Layers of Half-Lapped No. 33 Scotch Tape over entire joint.

10. Support Joint with Cable Supporting Bands, installed approximately 1½ in. from ends of joint and secured to messenger.

11. Applying Tape; do not stretch ¾ in. tape to less than ½ in. and 1 in. to less than ¾ in. width.

Thomas high-voltage pin-type insulators—quality-built for top performance

CHECK THESE FEATURES


A ROLLED EDGES contribute to general sturdiness, reducing chipping and breakage to a minimum.
B CORRUGATIONS are deep and well-rounded to allow maximum leakage surfaces—no dirt-collecting "pockets".
C TIE-WIRE GROOVES are amply spacious and far enough above the insulator head to provide full leakage distance.
D TOP GROOVES are spacious and well-rounded—no concentration of mechanical load on any one point.
E PIN HOLES have cemented-in zinc-shell thimbles which accurately fit standard 1⅜" insulator pins.
F GENERAL CONTOUR of the shell and high impact-resistance of wet-process porcelain minimize danger of breakage.
7½"
10½"
Catalog No. 2124-M
EEI-NEMA Class 56-3

Shown here is one of the Class 56 of EEI-NEMA high-voltage pin-type insulators made by Thomas Works.

Especially recommended for transmission applications, these insulators embody all the tested and proven refinements of design and construction that assure long service life and superior performance under severest operating conditions.

An added feature: All five Thomas EEI-NEMA High-Voltage Pin-Type Insulators are also available with Thomas "QT" (Quiet-Type) radio treatment at no extra cost.

Physical ruggedness and optimum electrical properties are obvious characteristics of Thomas High-Voltage Pin-Type Insulators. For full information, write *Thomas Works, Delta-Star Electric Division, H. K. Porter Company, Inc., Lisbon, Ohio. Offices in principal cities.*

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Porter Divisions: Cleveland, Connors Steel, Delta-Star Electric, Henry Disston, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings, H. K. Porter Company (Canada) Ltd.

Sales Outlook Pegged for Utilitymen

They hear at Middle West Service Co meeting that sales and promotion dollars will both go up. Industry sales programs for 1958 are outlined

Utilities can sell more kwhrs residentially in the coming years, but they're going to have to spend more dollars to do it. That, at least was the tone set by the outline of residential and farm sales potentials, programs and problems given utility executives by Middle West Service Co at its Utility Sales Conference.

Covers Many Problems

With his audience made up largely of client utility execs, Middle West Vice President M. R. "Mal" Rodger ran the gamut from electric heating, with its possibilities for load building and balancing, to the "Brooks' Committee" proposals for water heater standardization. Said Rodger: "The industry today is faced with more challenges and has more promises than ever before. To meet these challenges and capitalize on these promises, we need ideas—new ideas—and plenty of old fashioned drive and salesmanship." The drive and salesmanship the utility men will have to supply themselves, but the ideas—new and old—were thrown at them during the 3 day meeting. Examples: Westinghouses S. L. Forsythe and Consumer Power Co's A. F. Southwick sketched the revenue-producing of aspects of residential and commercial electric space heating, respectively. "Humidity Control—A New Load Builder" was the self-explanatory title of a speech by one of HC's pioneers, WP&L's G. B. Burdick.

Predict Heat Pump Cost Drop

The heat pump story was given by GE's Weatherton boss, H. M. Brundage. He expects the heat pump will drop in first cost another 5-10% in the next year or two. He also cautions: don't look for upped heat pump efficiencies with low cost. "It is now definite that no improvement in efficiency can be anticipated without a related increase in first cost. There is undoubtedly a balance between these two factors, but only time will indicate where that balance point is."

What's happening in the complex and headachey appliance business was set down by Laurance Wray, editor of Electrical Merchandising, a McGraw-Hill magazine. Biggest problems, says Wray, are appliance service and soaring distribution and packaging costs.

American Gas Association managing director Chet Stackpole outlined his industry's growth plans. AGA has stepped up research on gas air conditioning units (EW, July 1, 1957 p. 76). It has also boosted other activities, including advertising and promotion, searching for new reserves, and expanded distribution facilities.

Lighting's newest baby — the Academy of Lighting Arts—will be getting some trial runs. First company to give it a try is Interstate Power Co. at Dubuque, Ia.

The biggest threat down on the farm today is LP gas competition, according to W. J. Ridout, Jr, editor Electricity on the Farm magazine. Ridout's five-point Rx:

- Consider farm as a prime market rather than a secondary one.
- Prove to farmer what electricity can do for his business.
- Remember LP gas can be used for just about every heating and power job on the farm.
- Consider the farm and farm home as a unit.
- Sell better farming practices rather than individual machines.

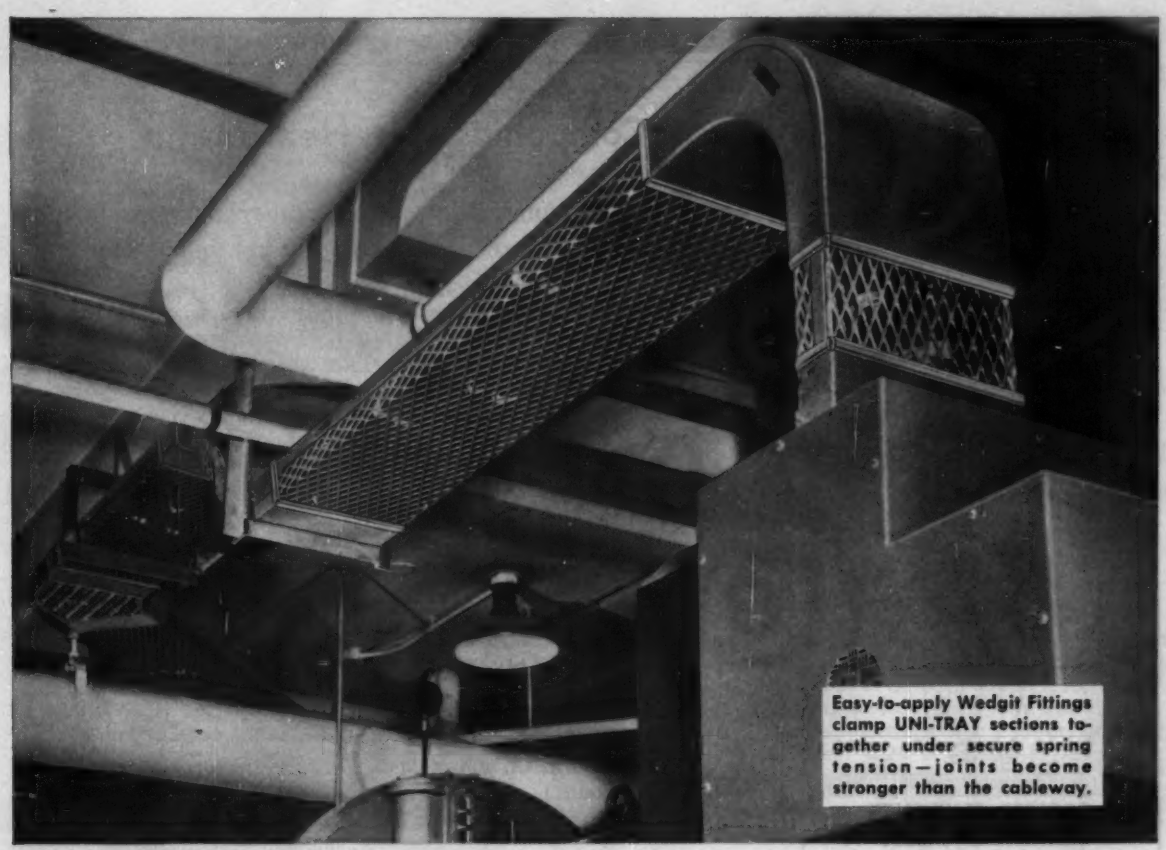
F. E. Wiley, commerical sales manager of McGraw-Edison's newly formed Toastmaster-Griswold division previewed his company's new commercial cooking equipment line.

Finally, Commonwealth Edison vice president T. G. Ayers reviewed the new recommended water heater standards. Ayers pleaded for support is the "first step" in healing this "sick" part of the business.

(*More Selling on page* 84)

Build Bank on 'Light' Foundation

In Milwaukee they're building banks around desired lighting effects. The good looking building shown above, a new branch office of the Wisconsin National Bank, was done that way. The architect worked closely with Wisconsin Electric Power Co's lighting specialist H. T. Koether, designing the building specifically to get certain lighting effects stipulated by the bank's board of directors. Result: A pleasant community bank that is also first class salesman for good lighting.



Easy-to-apply Wedgit Fittings clamp UNI-TRAY sections together under secure spring tension—joints become stronger than the cableway.

Lower installation costs with an improved

UNI-TRAY Cable-way System

With Delta-Star's UNI-TRAY Cable-ways you reduce installation time up to 40%—substantially cutting cableway costs. Simply position the trays, then tap in Wedgit Fittings to connect sections. No bolts, pins or hinges to fit or tighten. UNI-TRAY Cable-way joints are assembled four times faster than with other type fittings.

Strong, lightweight expanded metal sections provide ventilation necessary for high current rating of cables—prevent collection of water and dirt. Continuous Wedgit contact areas provide excellent electrical contact for ground currents.

UNI-TRAY sections are available in hot-dip galvanized steel, with aluminum Wedgit fittings. Aluminum sections also available. A wide variety of shapes and sizes meet specific requirements.

For complete facts, write for UNI-TRAY Publication No. 68—or see your nearby Delta-Star representative. *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois. District offices in principal cities.*

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

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Ventilate and Heat
Your Manholes with
Mo Pe Co
Ventilating Heaters

GREATER EFFICIENCY
INCREASED SAFETY
BETTER PRODUCTION

300 to 800 CFM fresh air in summer, heated fresh air in winter. 160 watt generator attached provides current for lighting manhole simultaneously.

MODEL PE-G
Portable, PE-G weighs 70 lbs.
Electric models also available.

Write for illustrated brochure on complete line of our products.

Select Distributorships
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Ohio Companies Plan Heat Meet

Six utilities will 'unveil' latest developments in electric heating and A. C. to area architects and consulting engineers

Six Ohio electric companies have banded together to "unveil" the latest electrical heating equipment and installation techniques to architects and consulting engineers in their areas.

Some 200 architects and consulting engineers will hear the electric heat story at the Neil House Hotel, Columbus on Nov. 21-22. The six sponsoring companies are Columbus and Southern Ohio Electric Co; Cincinnati Gas & Electric Co.; Ohio Edison Co, Toledo Edison Co; and Ohio Power Co. They are using collectively a very successful technique proven out individually by companies in other parts of the country. (Union Electric Co did it in St. Louis last month.)

Example of a Trend

This is another example of the trend toward recognizing the important part the architects and engineers will play in selling electric heat. Said R. W. Osterholm, commercial manager of Ohio Power, and chairman of the All-Electric Heating and Air Conditioning Symposium (as it is called): "Today, the home owner, the businessman and industrialist are looking to architects and consulting engineers for the best answers to heating and cooling. Electric equipment is the answer."

Five Topics Slated

Five major topics are slated for consideration during the two-day meeting:

- Motor-driven summer air conditioning equipment.
- Central plant heat pumps.
- Packaged heat pumps.
- Electric resistance heating equipment.
- Competitive equipment.

Sessions will feature several speakers, each covering some phase of the main topic.

Ten manufacturers will have officials on the program. However, at these "get acquainted" meetings it is customary to stay away from sales and products pitches and concentrate in principles, economics and installation techniques. Manufacturers represented are Worthington, Trane, Frigidaire, York, Carrier, Westinghouse, General Electric, Wiegand, Electromode and Wesix. They will have equipment displays at the meeting.

H & C BRIEFS

F-Q Bares Room Heat Pump

Fedders-Quigan Co recently introduced an air conditioning unit designed to heat in winter and cool in summer. Key to the 1½-hp unit is a reversible thermostat and heat pump that keeps room conditions at a set level despite outside air changes. Fedders also announced that it was abandoning suggested list prices. All pricing is to be left to distributors, whom, Fedders feels, know the local market best.

Lewyt's 1-Ton Midget

Lewyt Air Conditioner Corp began production recently of a small air conditioner. Designed to be no larger than the company's ½-ton unit introduced in 1954, the midget measures 15 x 14⅝ x 32$\frac{7}{16}$ in., and is engineered for through-the-wall installation.

Othello Has More Heat

Washington Water Power reports its electric heating promotion (EW, May 20, 1957 p 120) has met with exceptional success in the town of Othello, Wash. According to company officials, Othello has more residential and business heating applications per capita than virtually any other town in the company's two-state area.

(*More Selling on page* 86)

up to 20 TIMES more POWERFUL

. . . rugged new TRANSISTORIZED design

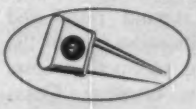
much greater operating range . . . now you can have the greatly extended coverage and clearer messages you've always wanted. These new HANDIE-TALKIE portable radiophones are by far the *most powerful* portables ever built!

much smaller, much lighter . . . new circuits, transistors and subminiature components make them as much as 50% smaller and lighter—truly *portable* and easy to handle for hours without fatigue. The dry battery pack model weighs only an ounce over 7½ lbs.

much lower operating cost . . . dry battery replacement costs have been cut as much as 67%! With adaptor, rechargeable wet cell models can be operated from a car's 6 or 12 volt battery to conserve portable's battery. For semi-permanent installation, a 117VAC power pack is available. All power packs quickly snap in place, making changing easy.

AVAILABLE IN CHOICE OF 43 DIVERSIFIED MODELS

LOUDSPEAKER models available



TRANSISTORIZED greater operating efficiency

MANY ACCESSORIES for extra versatility

WRITE TODAY

Get the full facts on this power-packed portable. Ask for the 6-page folder which will help you select the HANDIE-TALKIE radiophone best suited for your requirement.

NOW current delivery

Your overwhelming demand for this new portable temporarily upset our delivery schedules. Production has been stepped up to provide current delivery.

TRANSISTORIZED Handie-Talkie®
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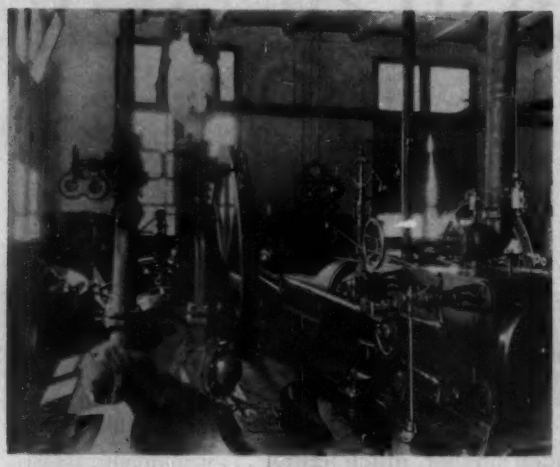
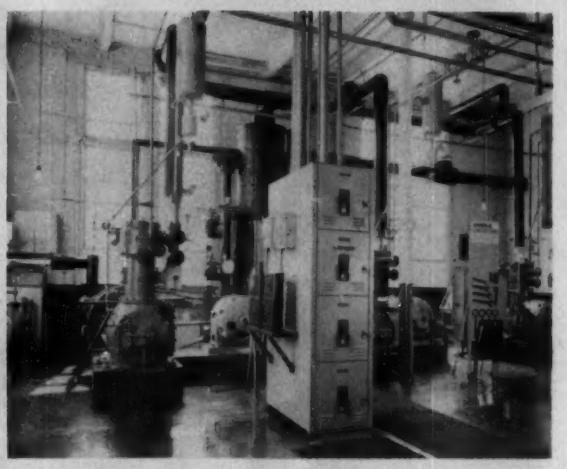


1909 steam driven machines vanish, . . .



electrification takes over as . . .

Modernization Clips Brewery Production Costs

JAMES E. PARKER, Industrial Engineer, Southern Colorado Power Co., Pueblo, Colo.

An aggressive modernization program, planned around purchased power and electrification proved the solution to rising production costs at one progressive brewery. Completed over an eight-year period, the redesigned facilities at the Walter Brewing Co in Pueblo, Colo., can now turn out in eight hours work that was once done in twelve.

Conversion of the d-c generation system and the steam driven reciprocating-type, piston-drive refrigeration compressor, which began in 1952, more than doubled the capacity of the refrigeration equipment and produced an 80% savings in coal usage. At the same time labor costs dropped 20%.

After these major units had been changed, all the old individual motor drives throughout the brewing side of the operation were converted from dc to purchased ac. This conversion was interwoven with such improvements as an outside laboratory's product analysis program, installation of a modern filter system, modern air compressors, wort cooler, hop strainer, and corn grinder equipment.

The power conversion was undertaken after an extensive study of the relative merits of a steam drive and purchased electric power. The study results favored purchased power. After the conversion was completed, it was evident that the original study conclusions had been conservative in estimating savings.

The survey was made after a change in management took place in 1948. At that time, sales were lagging and production costs rising. The new management immediately put into effect a $500,000 modernization program, projected over a ten-year period.

After the brewing operation had been completely modernized, conversion of the bottling and canning plant was begun. Modern equipment, such as a new pasteurizer, can seamer, can filling machine, complete can track line, andrematic six-pack carton machine, and a glass bottle line was installed. Production went up 50%. With a 150,000 bbl annual capacity, the brewery has a 300-kw load.

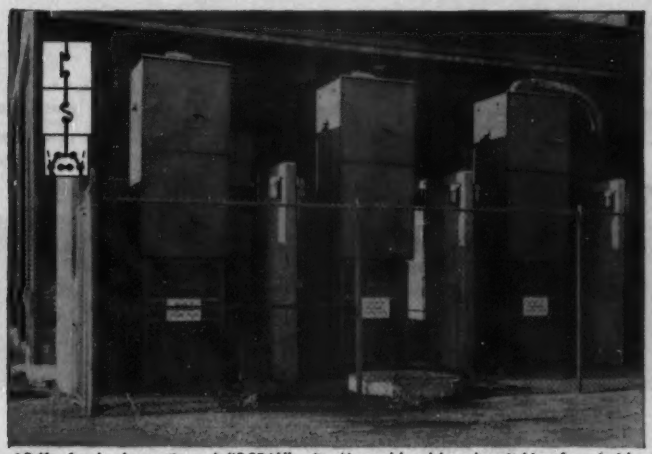
Established in 1889, Walters produces beer under five different labels. Products are distributed in 15 states in the Rocky Mountain, midwestern, and southern parts of the country. With a year-round employment of 70 people and a $350,000 annual payroll, quality control, labor-saving devices, space saving, and efficient brewing methods were imperative in this highly competitive industry.

Electric Pump and Ingenuity Clean Coal

THOMAS BALLOTS, Power Sales Engineer, Pennsylvania Power & Light Co, Hazleton, Pa.

A method of separating wood particles and other light weight refuse from coal in a final cleaning operation has been devised by the Beaver Brook Coal Co of Audenried, Pa. Basically, the system consists of a 7.5-hp conveyor passing through a trough of wash water of predetermined specific gravity.

When the coal and refuse on the conveyor enter the trough, the refuse floats free while the coal remains on the conveyor. A 3-hp pump recirculates the wash water to eliminate the necessity for a continuous water flow. Recirculation keeps the specific gravity almost constant, although it can be varied if necessary by dilution with clean water.

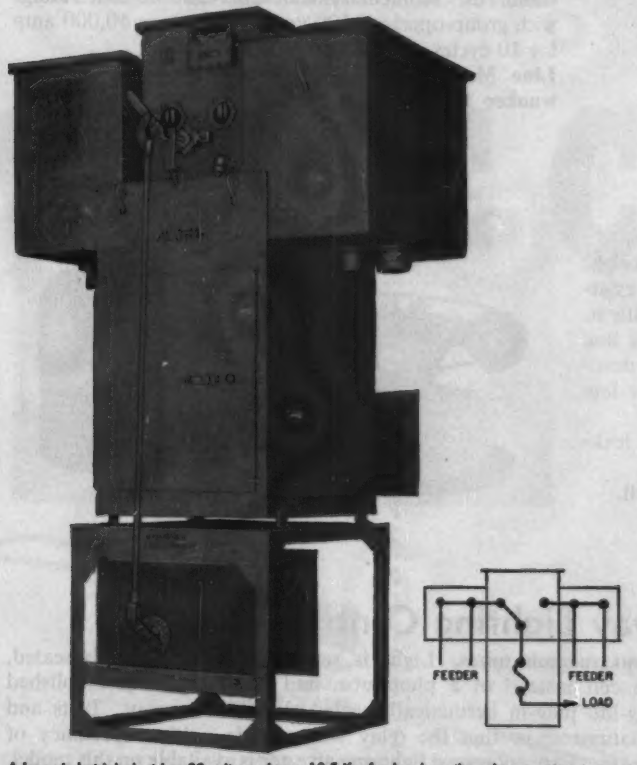


12 Kv. feeder loops through "SCRAL" units. Manual load break switching from inside of building. Isolating air break disconnects on load side of power fuses.

Two single throw "RA" load break oil switches with air break isolating links. Load circuit fuses in middle compartment.

G&W COMBINATION "SCRA" SWITCH-FUSE UNITS

Save Installation Labor & Maintenance Costs



A large industrial plant has 23 units as shown. 12.5 Kv. feeders loop through compartments on two sides of "RAD" double throw automatic transfer oil switch. Transformer (not shown) is attached to back of unit and fed through power fuses in middle compartment.

CD573

COMBINE IN ONE FACTORY ASSEMBLED UNIT—

- Load break "RA" oil switches for feeder selection or disconnection.
- Power fuses for load circuit protection or isolation.

Installation labor saved because it is only necessary to connect feeder and load cables.

Maintenance costs reduced by elimination of exposed buses, disconnects, etc.

G & W combination switch-fuse units are functionally designed for compactness and minimum cost. They are ordinarily custom built to meet individual requirements. They may be enclosed in straight line metal cabinets to match other equipment. USUAL RATINGS—400 AMPERES, 5, 7.5 & 15 Kv.

The "RA" load break oil switches may be one double throw or two single throw switch units—manually or automatically operated. Disconnecting links may be included on one or both sides of oil switches for air break isolation. Feeder and load cable potheads or terminating compartments for lead covered or neoprene jacketed cables may be located at top or bottom sides or back of the combination unit.

Call in our representative for recommendations of Switch. Fuse units to meet your requirements.

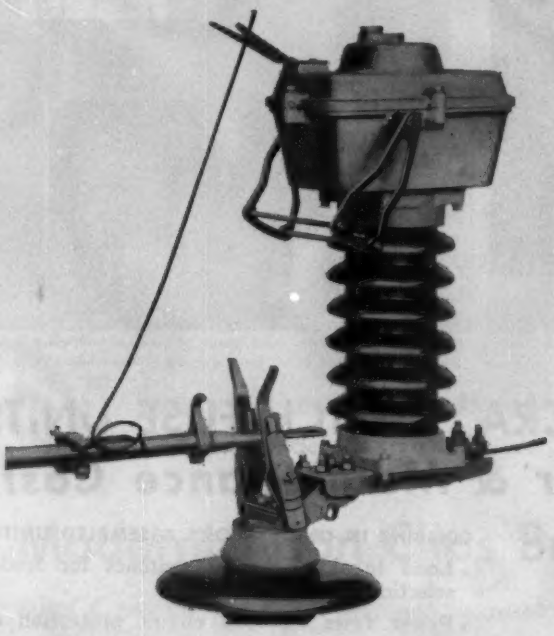
G&W ELECTRIC SPECIALTY CO.
3500 W. 127th Street, Blue Island, Illinois
Representatives in many cities of N. & S. America
In Canada—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

G&W

High Voltage Cable Terminating, Sectionalizing, Protecting, and Connecting Devices

POTHEADS • BOXES • OIL FUSE CUTOUTS • LOAD BREAK OIL SWITCHES • SPLICING KITS

NEW EQUIPMENT



Oil Interrupters . . .

. . . for 46- and 69-kv circuits have current rating of 600 amp. Units mount on new or existing vertical-break, group-operated, outdoor horizontal-mounted air switches to interrupt or pick up load currents and transformer magnetizing currents.

Each unit has porcelain housing, internal contacts, and mechanism, and an external rod to shunt current through interrupter while main switch blade is being disconnected. Current-carrying contacts have copper-tungsten arcing tips and make or break under oil at high speed, independent of speed of operating switch blade. Interrupter linkages are aluminum for high speed operation.

The units meet all NEMA and AIEE interrupter standards. Momentary and short-time current ratings with group-operated 600-amp switches are 40,000 amp for 10 cycles, and 25,000 amp for 4 sec.

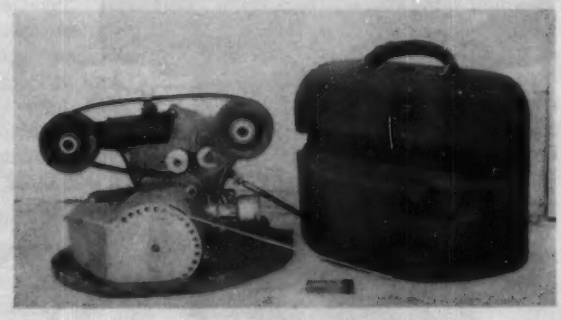
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

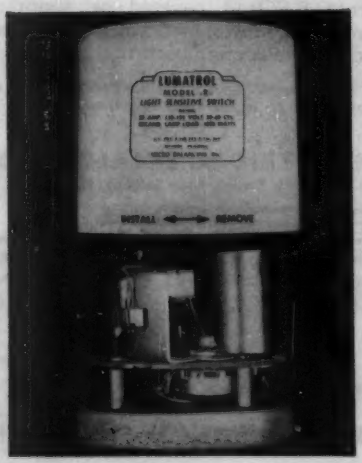
Mobile Power Unit . . .

. . . pulls lines over rough country. The lightweight power unit in its fibre-glass case travels along an existing line at 3 to 4 mph, drawing a throw line with it. It travels on two 4-in. pulleys and can pull throw line up a 15-deg grade without slippage. Once at its destination, lineman pulls throw line, with new power line attached, to point of connection.

"Tow-A-Line" takes 10 kv with less than 1 ma leakage. Power is a ⅓ hp gasoline engine.

Tow-A-Line Co, 5635 East Drive, Loves Park, Ill.





Highway Lighting Control . . .

. . . has no vacuum tubes. Light is sensed by a hermetically-sealed, replaceable cell instead of a phototube, and switching is accomplished with a long-life plug-in hermetically-sealed electrostatic relay. Tests and field installations show that the relay will provide a life expectancy of up to ten years. Expulsion type lightning arrester is available on this model.

The control is housed in a weatherproof cover with omnidirectional light-sensing characteristics. This, together with plug-in mounting, makes the "Lumatrol" Model R simple and quick to mount on luminaires, poles, or cross-arms.

More details on the Model R are available in "Lumatrol" Bulletin 101.

Micro Balancing, Inc, Garden City Park, N. Y.

(More New Equipment on page 90)

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR
This Clamp Will Handle All Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

Drop wire can be pre-sagged and cut to exact length needed.

Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails

STANDARD FLEXIBLE CAPTURED FLEXIBLE FREE

JASPER BLACKBURN CORPORATION 1525 WOODSON RD., ST. LOUIS 14, MO., WYDOWN 3-9430

Facts to file and not forget about BERMICO® electrical conduit

BERMICO Electrical Conduit

Cellulose and high molecular strength coal tar pitch

MATERIALS	
Dielectric strength	
Dry	48-52 kv.
Wet	24-36 kv.
Electrical resistance	High
Fusibility, if a conductor fails	None
Heat resistance	High
Cold embrittlement	Low
Acid and alkali resistance	High
Mechanical strength (Beam, crushing, impact)	Exceeds WC-581
Weight (4" diam.)	2 lbs. per ft.
Abrasiveness to cable insulation	Nil

the conduit that gives you maximum, lasting protection with minimum cost!

BERMICO ELECTRICAL CONDUIT

Engineered to exacting standards, Bermico Conduit provides lightness, strength, and uniformity that makes it easy and fast to install. Made of cellulose fibre, impregnated with high-molecular-strength coal tar pitch with low mineral content. Bermico gives maximum protection against water. In event of cable failure, it permits easy pullout and replacement of conductors.

A hammer tap is all that's needed to make permanent, water-tight joints. Bermico comes in 8′ lengths to speed laying. Diameters are from 2″ to 6″. For economy, protection, long life, always specify Bermico Conduit. Immediate shipment of all sizes and fittings.

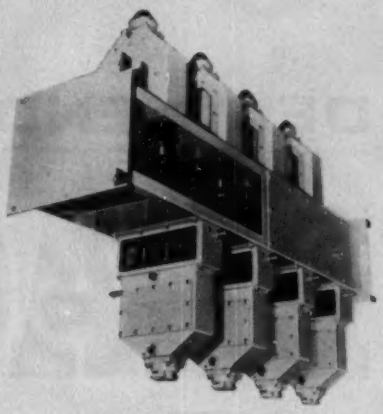
Distributed by WESTINGHOUSE Electric Supply Company

Offices in principal cities

BROWN COMPANY

BERLIN, N. H.

General Sales Office: 150 Causeway Street, Boston 14, Mass.



Disconnect & Bus Duct . . .

. . . **are combined** in the compact "Isoduct". Straight-line telescoping action performs disconnecting operations in limited space. Working parts and bus are completely enclosed. Interchangeable "Isolators" and potheads aid in extending bus. **Electrical Engineers Equipment Co, Melrose Park, Ill.**

Silicon Rectifier . . .

. . . **for dc utility service** can be installed in street vaults. It measures 83x45x85 in. Seam-welded steel-plate case is submersible. Input is 208 v, 3 phase, 60 cycle, 4 wire; output is 120/240 v dc, 1,000 amp, 3 wire. Regulation: 5% with constant line voltage.
Richardson-Allen Corp, 116-15 Fifteenth Ave, College Point, L. I., N. Y.

Magnetic Contactor . . .

. . . **for heavy duty** features arc centering for efficient interruption and long arc-shield life. Single adjustment of floating, self-aligning armature provides quiet operation. The Bulletin 5005, size 5, 300-amp contactor has self-lubricating bronze bearings, stranded-copper shunts, interchangeable copper contacts, and stainless-steel contact springs. **Euclid Electric & Mfg Co, Madison, Ohio**

(*More New Equipment on page* 92)

RT&E Transformers

Weather Protected to Serve Longer

Like the postman, neither rain nor snow, nor hail, nor salt spray can prevent R T & E Transformers from doing their duty. Here's proof that every R T & E unit is completely "WEATHER PROTECTED."

- **FINISH:** Three coats of modified Alkyd paint for all season protection.
- **DESIGN:** Domed cover for immediate water run-off.
- **TANK:** Arc-welded seams and absence of lip on tank bottom mean no moisture collecting cracks and crevices.
- **BUSHINGS:** HV bushings internally clamped — no external clamps and bolts to corrode.

Plus stainless steel cover band to eliminate corrosion on accidentally scratched areas . . . stainless steel threaded mounting pads . . . all unpainted fittings either galvanized or electro-tinned.

R T & E "Weather-Protected" Transformers last longer, require less maintenance, serve better all year 'round.

Equipment to help provide power for America.

R T & E CORPORATION
WAUKESHA, WISCONSIN

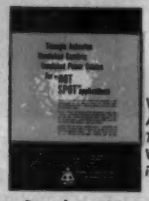
SOLVE

WIRING PROBLEMS IN HOT LOCATIONS WITH TRIANGLE AVA CABLE

Triangle AVA Cable is a practical answer for all types of wiring in hot locations, particularly if oil, grease and corrosive fumes are a hazard. The insulation consists of a uniform wall of high dielectric strength varnished cambric sandwiched between two walls of glass reinforced asbestos impregnated with a chemically inert flame retarding, moisture resisting compound. An outer covering of glass reinforced asbestos braid, saturated and finished with flame and moisture resistant compounds, is applied over all.

AVA Cable can be pulled in conduit or can be installed as open wiring. It is recommended for power and lighting wiring in boiler rooms, steam tunnels, steel mills, soaking pits and other high temperature surroundings.

TRIANGLE CONDUIT & CABLE CO., INC.
New Brunswick, New Jersey



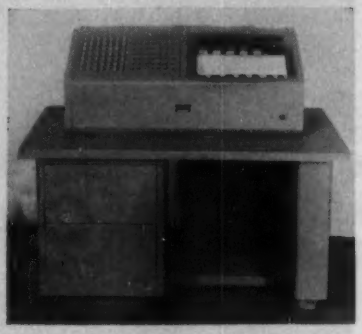
Write for bulletin AVA-10 describing Triangle Asbestos Varnished Cambric insulated cables.

Buy Smart — Buy from Your Distributor

TRIANGLE
"It MUST Be Right"

Disc Brake . . .

. . . is more easily mounted than its predecessor. The shorter, lighter electromagnetic brake features single point adjustment for lining wear, and a visual indication of the condition of friction linings. The Style "UH" 70 Series offers units rated at 10, 15, 25, 35, 50, and 75 ft-lb maximum torque. At present only the a-c model is available.
Stearns Electric Corp, 120 N. Broadway, Milwaukee 2, Wis.

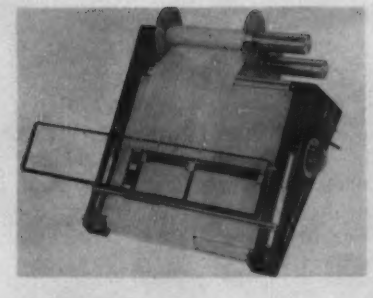


Sequential Recorder . . .

. . . for automated power plants and other applications of instrument-supervised equipment, monitors 80,000 events per second. The "SARA" prints a continuous record of deviations from normal, in the order in which the events occur. This helps pinpoint causes of plant failures by telling which equipment failed first.
Taller & Cooper, Inc, 75 Front St, Brooklyn 1, N. Y.

Adjustable Speed Drives . . .

. . . use silicon rectifiers in voltage regulator to eliminate warm-up period and moving parts. Motor-generator set is of two-unit, four-bearing design. The drives come rated from 3 to 150 hp, and in speed ranges of 8 to 1 and up. They take less space than their predecessors, and have unit-mounted, front connected controls. Applications include continuous processing lines, calender drives, machine tools and paper processing machinery.
General Electric Co, Schenectady 5, N. Y.



Oscillogram Reader . . .

. . . for any number of channels, linear or non-linear, corrects for scale factor and zero-line location. The model R-1 also features hand or foot control, variable speed, and cantilevered 6-in. rolls that take film from 0 to 16 in. wide.
Gerber Scientific Instrument Co, 162 State St, Hartford 3, Conn.

Trench Digger . . .

. . . is fully mobile, digs up to 8 ft of trench per min. Trench width: from 4 to 16 in. at 2-in. intervals. Depth: 12 to 42 in. The model LD "Ditch-Witch" has automotive steering, 15-in. drive wheels, and a reversible spoil conveyor.
Charles Machine Works Inc, Perry, Okla.

Cable Wrapper . . .

. . . of spirally-cut plastic eliminates cable lacing. "Amp-Spirap" holds wire bundles up to 3½-in. diameter, is quickly wound, and allows a wire to be led out at any point. It does not damage insulation.
AMP Inc, Harrisburg 19, Pa.

Quartz-Lamp Ovens . . .

. . . sinter Teflon with infrared rays. Temperatures of 700F to 740F can be obtained in 40 to 80 sec. Ovens

(*Continued on page* 94)

BUY

ALL TRIANGLE PRODUCTS LOCALLY FROM YOUR ELECTRICAL DISTRIBUTOR

It's smart today to buy all your electrical needs — wire, conduit, cable, switches, fittings — from your nearby distributor. One call shopping saves you time and money.

Your distributor's warehousing saves you countless cubic feet of valuable floor space, and assures you of a constant flow of fresh materials as your schedules demand.

Your distributor gives you

Fast delivery . . . on one item or a hundred— from one manufacturer, or from many.

Simplified bookkeeping . . . one invoice, one statement, one account.

Low inventory cost . . . his stock is your inventory control, gives you working capital.

Lower insurance rates . . . less inventory means your flood, fire rates are lessened.

That's why dependable electrical manufacturers advise you to always buy from YOUR DISTRIBUTOR — THE BEST FRIEND YOUR BUSINESS CAN HAVE! He's the one source for everything electrical — and he's local.

Your Distributor— The Best Friend Your Business Can Have!
TRIANGLE CONDUIT & CABLE CO., INC
New Brunswick, N. J.
TRIANGLE
"It MUST Be Right!"

ALUMINUM
OR GALVANIZED STEEL
SUPPORT SYSTEMS
FOR POWER AND CONTROL CABLES
IN-FREE-AIR
DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

Mr. Engineer...
Mr. Contractor...

HUSKY
CABLE SUPPORT SYSTEMS
are NOT ONLY
RECOMMENDED and APPROVED
by ALL Leading
CABLE MANUFACTURERS
They are actually SOLD by
MOST of the large cable
manufacturers.

NO OTHER
POWER CABLE SUPPORT
SYSTEM HAS THIS DISTINCTION.

DO YOU KNOW WHY??

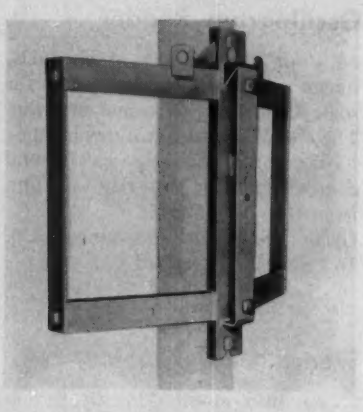
The only "electrically sound" system; let us explain...
or...ask your cable manufacturers representative.

ALSO...
Send for your copy of the story of
"CABLE IN-FREE-AIR"

AVAILABLE THROUGH LEADING CABLE MANUFACTURERS

HUSKY PRODUCTS, INC.
5300 VINE STREET, CINCINNATI 17, OHIO

use linear-shaped quartz lamps ⅜ in. in diameter with rating of 100 w per linear in. Ovens are available in many shapes and sizes.
Fostoria Pressed Steel Corp, Fostoria, Ohio



Mounting Brackets . . .

. . . for banking transformers rated 3 to 167 kva, single phase, come in three sizes. They take combinations up to three 25-, three 50-, and three 167-kva transformers. Of integral construction, they are fixed to pole with through bolts, leaving 120-deg working space. The cluster-mounting brackets meet EEI-NEMA clearance requirements.
Line Material Industries, Milwaukee 1, Wis.

Intercom System . . .

. . . combines dialing and keying to keep trunks open while people who must call each other frequently do so on separate circuits. Automatic dial switchboard that permits this integration comes with 30 lines and up. It provides paging, automatic ring signal, incoming call identification, and automatic "memo of call." Only external power supply needed is 110 v ac (no dc supply is necessary).
Dictograph Products Inc, 95-25 149th St, Jamaica 35, N. Y.

(*More New Equipment on page* 96)

100,000 feet of trench in eight months on scattered jobs—that's what a Barber-Greene ditcher delivered for a Midwest utility company.

12 Barber-Greene ditchers travel 800 miles ... dig 100 jobs daily

To speed up house service installation, a Midwest utility, name upon request, bought three Barber-Greene Model 711 Ditchers. These ditchers paid off so well that nine more similar units with variations in boom design were soon added to meet the growing need for fast service trenching in the 250 different communities served by this progressive utility. This fleet of 12 has dug over 625,000 feet of trench in less than a year. As a result of this performance record, four more of these versatile ditchers have been added to the line—boosting the total to 16.

Here are some of the features of the Barber-Greene Model 711 . . .

Unmatched mobility: Rubber-tired mounting provides fast job-to-job travel. Easy to drive, this Barber-Greene cruises at 45 m.p.h. . . . shrinks distances between jobs.

One-man operation: Once on the job, the operator merely lowers the boom and starts digging. Hydra-Crowd control permits infinite range of digging speeds from 0-13 feet per min.

Greater traction: . . . with four-wheel drive. An important feature when digging on slopes and hillsides or on soft, muddy ground that often surrounds new housing projects.

Saves lawns and curbing: Low bearing pressure and proper weight distribution offer real protection to lawns, sidewalks and curbing. Low height prevents entanglement with trees.

This is just one of five different Barber-Greene ditchers, each designed to cut costs on a wide variety of jobs.

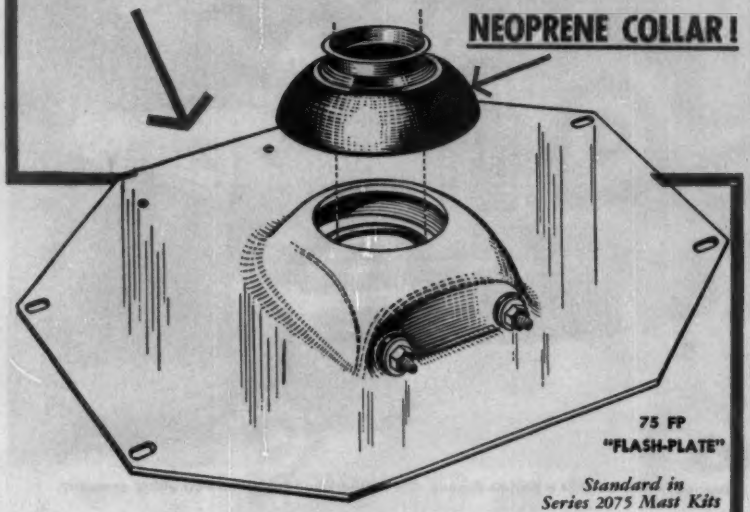
Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

new

from Porcelain Products . . . combination roof-plate and flashing with NEOPRENE COLLAR!

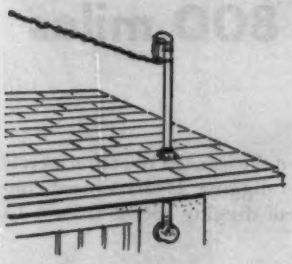


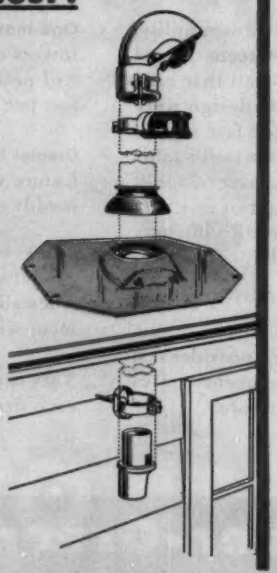
Standard in Series 2075 Mast Kits

Makes installation

- QUICKER—fewer parts
- EASIER—no caulking

at Less Cost!





Now, Porcelain Products Mast Kits feature FLASH-PLATE, a combined roof-plate and flashing, plus a lifetime, watertight Neoprene collar. The "one-piece" feature makes Porcelain Products Mast Kits easier to install . . . provides a stronger, longer lasting, safer entrance mast . . . ALL AT *LESS* COST TO YOU!

Flash-plate is heavy, 14 gauge galvanized plate. It supports a 2" or 2½" mast on any roof, neatly and effectively, *with no caulking* needed. Available through recognized electrical distributors or write for further information.

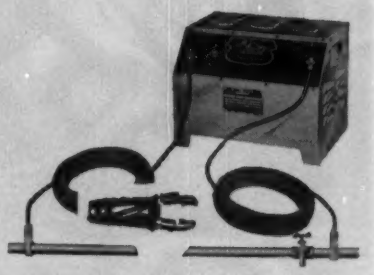
ELECTRICAL PORCELAIN SINCE 1894

63 years **Porcelain Products, Inc.** PP INC.

FINDLAY, OHIO

Transmitter . . .

. . . **is transistorized** and redesigned for carrier current service. Uses of the crystal-controlled type CT-50B include automatic dispatching, remote station supervisory control, telemetering, and transferred tripping. Frequency: 30 to 200 kc.
General Electric Co, Communication Products Dept, Electronics Park, Syracuse, N. Y.



Pipe Thawer . . .

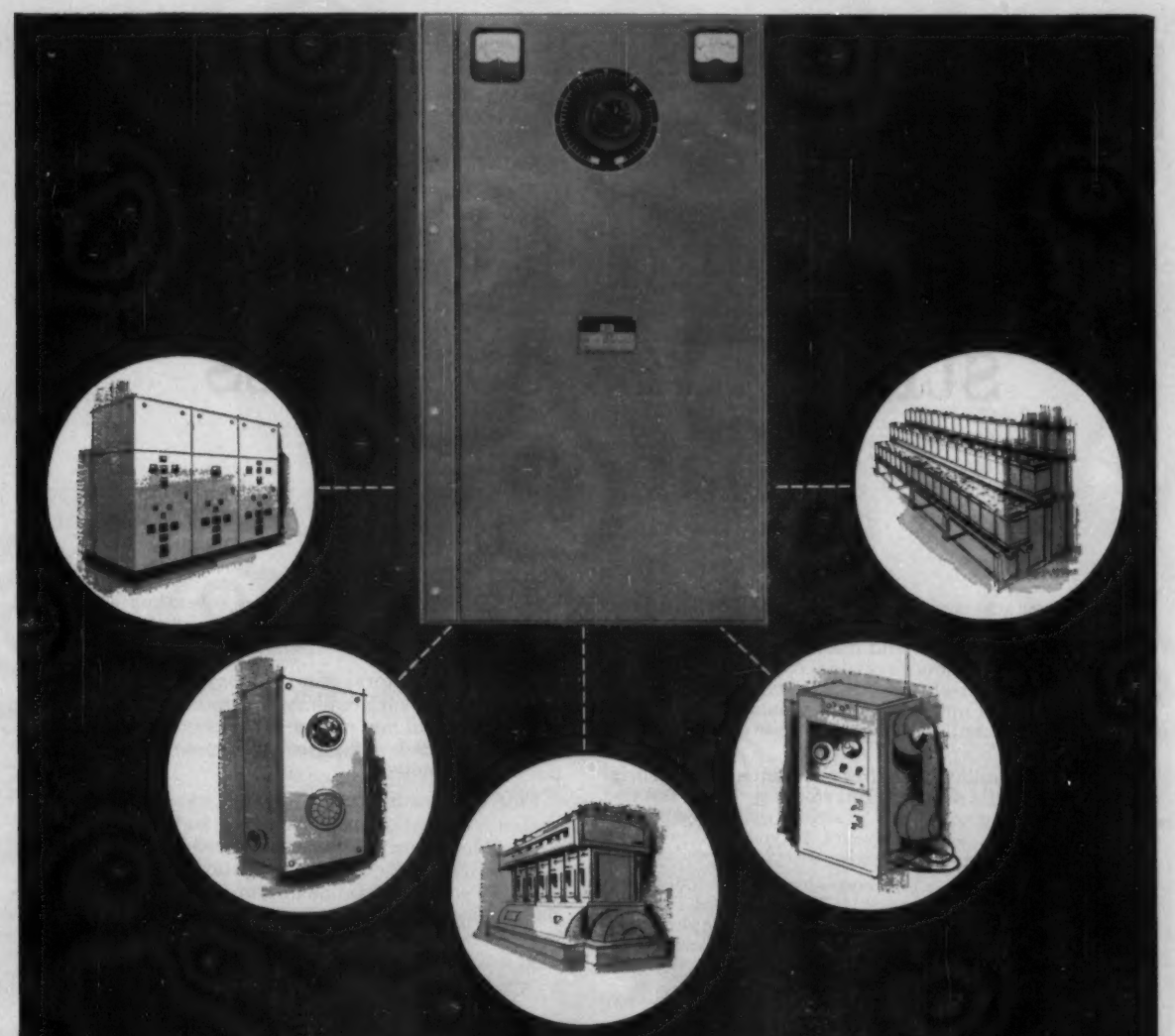
. . . **runs on 110 v, 15 amp.** Frozen pipe is thawed by clamping leads so that pipe completes circuit. With special attachment it also sweats pipes and tubes together, solders, and brazes. "Therm-O-Tron" comes with 40 ft of cable. Extra cable is available.
Dept 16, Trindl Products, Ltd, 1807 S. Clark St, Chicago 16, Ill.

MORE NEW PRODUCTS

Hollow-shaft gearmotors combine double-enveloping worm gearing with helical primary to provide high output torque. Available for 1- to 15-hp standard NEMA D-flange motors.—Cone-Drive Gears Div, Michigan Tool Co, 7171 E. McNichols Rd, Detroit 12, Mich.

Non-mechanical **scanner** converts a curve drawn on graph paper into a voltage for programming radiant heat. The all-electronic unit does not have speed limitations of electromechanical devices.—Spar Engineering & Development, Inc, Paxson & South Ave, Wyncote, Pa.

(*More New Products on page* 100)



NEW WESTINGHOUSE SELENIUM BATTERY CHARGERS

OFFER LONGEST LIFE, QUIETER OPERATION, NO MAINTENANCE

Whatever your battery-charging requirements, you'll find the economical answer in Selenium Battery Chargers by Westinghouse.

Westinghouse chargers will handle all types of batteries. They are designed for either cyclic or trickle charging operations in a wide variety of applications, including switchgear control, signal, engine starting, communication and powerhouse batteries.

Offering maximum return on your investment, these chargers, built with Westinghouse selenium stacks, made by vacuum process, combine longer life with higher efficiency . . . eliminate wear through the exclusion of all moving parts . . . reduce operating noise level through convection cooling.

For more information about Selenium Battery Chargers for your specific requirements, contact your Westinghouse sales engineer. Or, write to Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pa. Ask for descriptive bulletin 19-200.

J-22068

YOU CAN BE SURE...IF IT'S Westinghouse

FACT:

Aluminum substation structures cost less than steel

The four graphs show comparative costs of large and small aluminum and steel substation structures in corrosive industrial and marine atmospheres. Note that while aluminum's original cost is slightly higher than that of steel, the favorable cost differential of steel is eaten up by high maintenance costs in only 3 years for small structures, 10 years or less for large structures.

Since aluminum requires no maintenance, its original cost is its real cost. But steel's cost does not end with its original cost . . . steel's maintenance cost keeps mounting—for 5 years, 10 years, 20 years, as long as the structure stands.

Steel substations in corrosive areas require two coats of paint every five years to prevent rust and corrosion. Often, the structure must be re-galvanized, which means it must be disassembled. Costs of rehabilitating a steel structure can run as high as 5 to 12 cents per pound of structure.

On the other hand, aluminum substation structures can't rust, resist corrosion, never need painting—maintenance costs are eliminated.

Aluminum's natural affinity for oxygen results in a thin, hard oxide surface film which resists highly corrosive industrial and marine atmospheres. The cost of painting, made even greater by power interruptions, is eliminated.

Find out now how aluminum can meet your substation specifications more efficiently and at less cost. Kaiser Aluminum's highly experienced engineers are available, without charge or obligation, to assist you with any substation problem. For immediate attention, contact the Kaiser Aluminum sales office listed in your telephone directory—or write: *Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Ave., Chicago 11, Illinois.*

New Booklet Gives Complete Information

Kaiser Aluminum's new 48-page booklet, *"Aluminum Substation Structures"* fully explains the many advantages of aluminum and offers complete design information—including most economical usage, recommended alloys, substation details and extensive design formulas, tables and diagrams. To get this informative free booklet write: *Kaiser Aluminum & Chemical Sales, Inc., Industry Development Department, 919 N. Michigan Ave., Chicago 11, Illinois.*

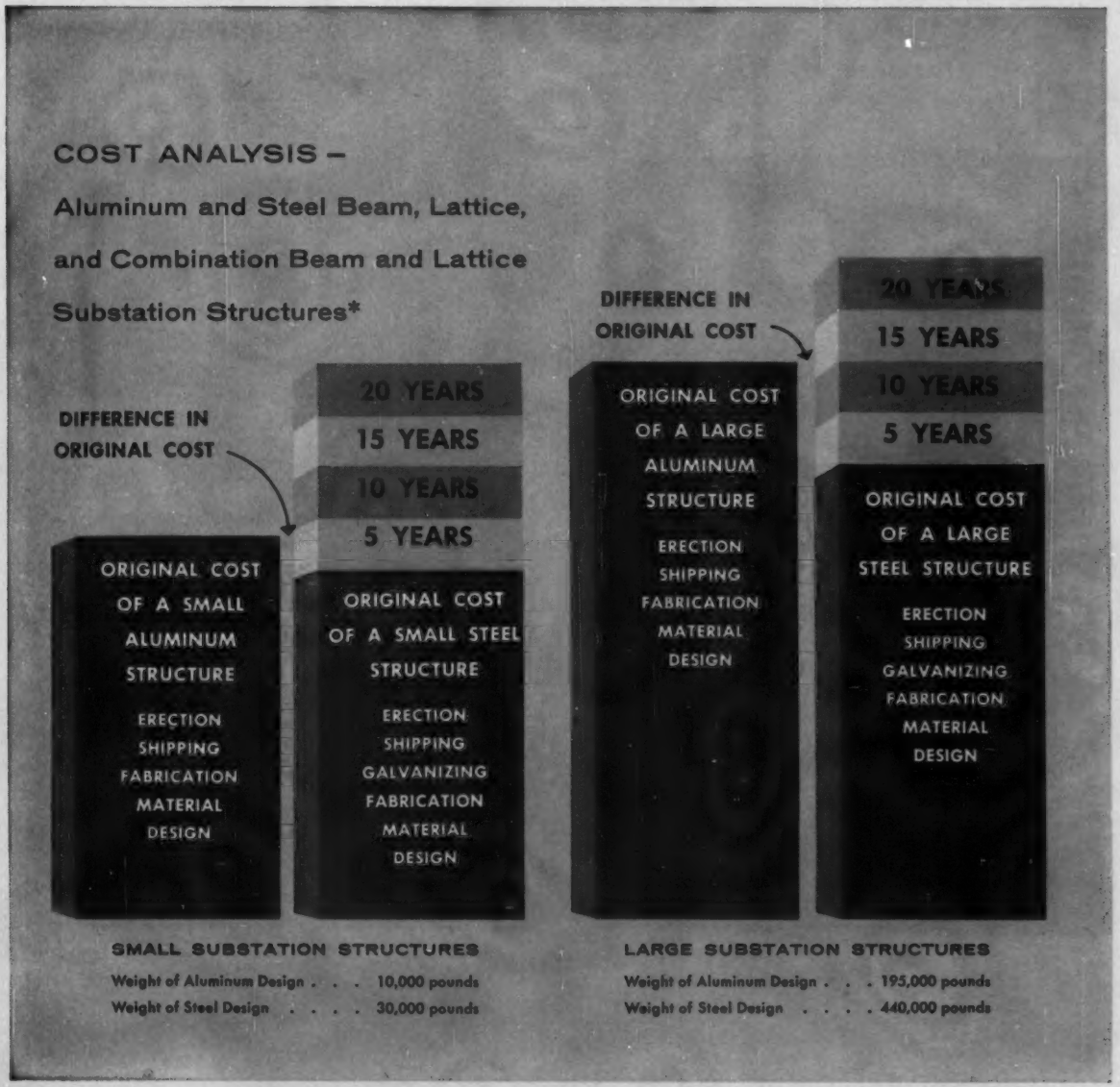
KAISER Aluminum

THE BRIGHT STAR OF METALS

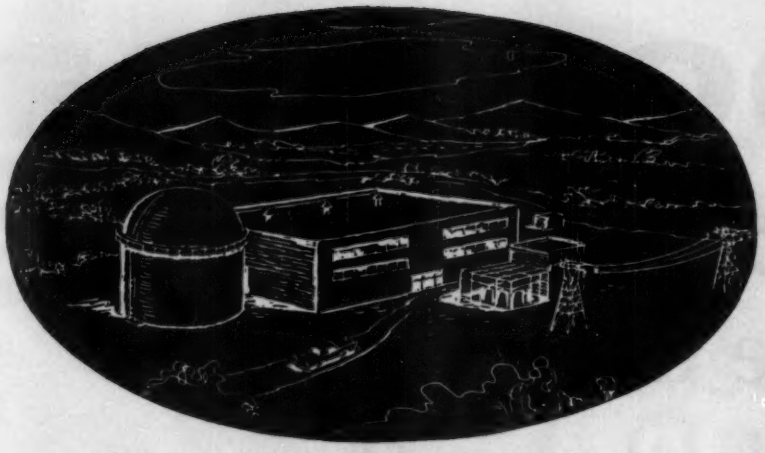
While Kaiser Aluminum does not fabricate and erect substation structures, we do supply leading erector-fabricators with high quality American standard extruded angles, channels and "I" beams. Call your local Kaiser Aluminum sales office for immediate attention.

PROOF:

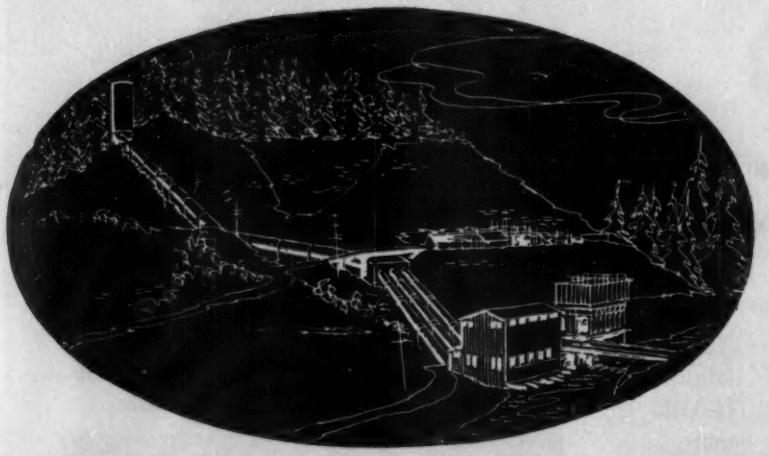
Maintenance makes the difference



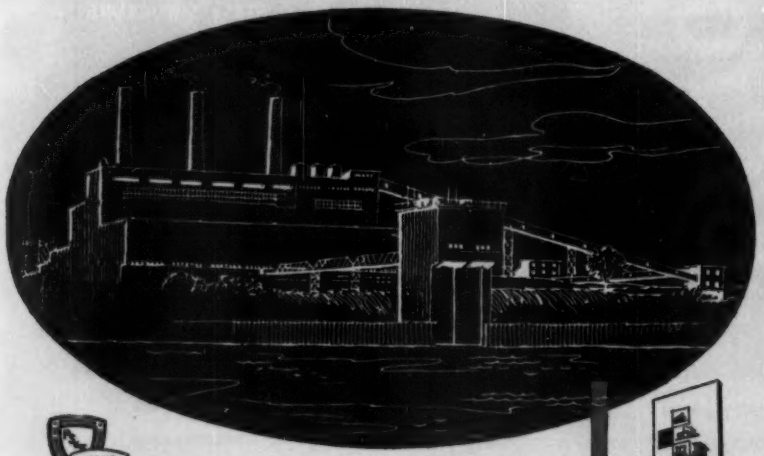
*Based on an average of maximum and minimum cost figures obtained from utilities, fabricators and electrical equipment manufacturers across the country.



PUTTING **POWER** INTO
YOUR EXPANDING PROGRAMS



ATOMIC, HYDRO and FOSSIL FUEL POWER PLANT DESIGN
FOR INDUSTRIALS and UTILITIES



55 YEARS

Pioneer Service & Engineering Co.

231 South La Salle Street • Chicago, Illinois

Send for our descriptive booklet, "Pioneering New Horizons" of these and other services.

A "Series 4000" **floodlight** will accommodate PS lamps from 300 to 1,500 w. Cooling fins and thermal-shock-resistant lens prolong lamp life.—Steber Mfg Co, Broadview, Ill.

Generator regulators allow less than 3% transient output voltage variation due to varying loads, less than 1% due to steady load changes. The 60- and 400-cycle regulators can handle generators up to 50 kw.—Gemco Electric Co, 25685 W. Eight Mile Rd, Detroit 40, Mich.

High-temperature **insulating channel wedges** in a wide range of sizes are laminated from woven glass cloth impregnated with silicone or polyester resins. Tough and non-absorptive, their dielectric strength is over 100 v per mil—Silicone Insulation, Inc, 1383 Seabury Ave, Bronx 61, N. Y.

Dynamometer control replaces flywheels with a potentiometer to ease acceleration testing of vehicles.—General Electric Co, Schenectady 5, N. Y.

New 1,000-w **mercury-vapor lamps** are semi-reflector type. Also available are 425-w lamps for 277-480-v systems.—Sylvania Electric Products, Inc, 1740 Broadway, New York 19, N. Y.

Skived tape for wire and cable-wrapped insulation has dielectric strength of 1,000 to 2,000 v per mil, zero moisture absorption, is good from —400F to 500F. Available in thicknesses from 0.002 in. up.—Dixon Corp, Bristol, R. I.

Automatic water softener with electric timer completes regeneration cycle periodically. Any frequency of regeneration can be pre-set.—Culligan, Inc, Northbrook, Ill.

Fuse box for 125-amp house-wiring has six pull-cover and 12 plug-fuse circuits, takes aluminum or copper wire—The Wadsworth Electric Mfg Co, Inc, Covington, Ky.

Electrical **stop clock** features instantaneous reset (0.1 sec) and accuracy (0.01 sec). It is hermetically sealed and shock-resistant.—Cramer Controls Corp, Centerbrook, Conn.

BOOKS

All About Maintenance

Maintenance Engineering Handbook. Edited by L. C. Morrow. Published by the McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N. Y. 1,528 pages, illustrated. Price $20.00

The first engineering handbook in the field, this comprehensive work draws on the experience and know-how of 75 specialists to cover the entire maintenance field in a highly practical manner.

The first quarter of the book, aimed primarily at management, is devoted to topics such as organization of the department, budgeting and cost control, use of outside contractors, and union relations. A lengthy treatment of preventive maintenance details, methods of setting up a program, selecting inspectors, and selling the program to top management. The chapter on personnel training describes typical programs successfully used for various crafts. Other valuable inclusions are job analysis, cost estimating, and organization of paper work.

Maintenance techniques for various types of equipments and services make up the remainder of the book. The electrical section includes an excellent chapter on a-c and d-c motors, a detailed discussion of illumination, and suggested procedures for servicing distribution transformers, switchgear, and motor control units. A condensation of cable and copper capacities, taken from the National Electrical Code, is provided for easy reference. Chapters on batteries, grounding, brakes, and industrial electronics round out this section.

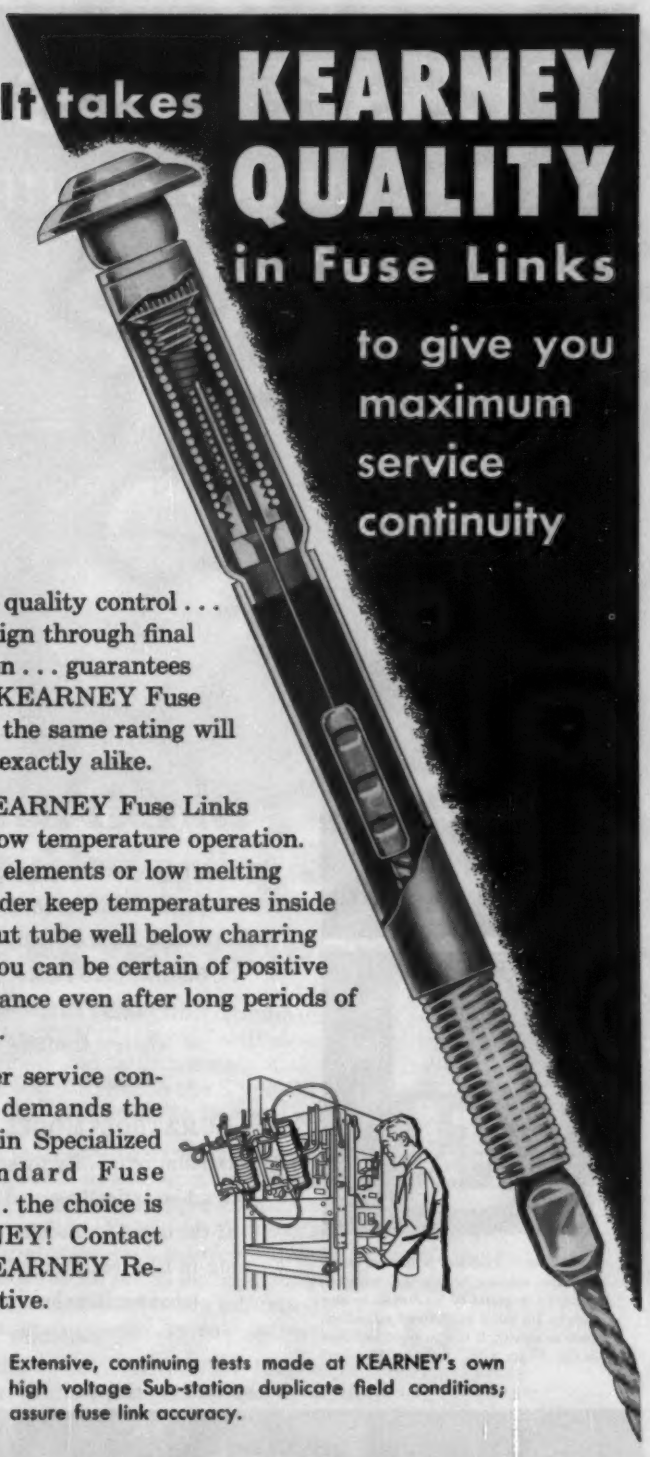
A high percentage of the 305-page discussion of service equipment is alloted to maintenance of boilers, turbine-generators, pumps, pulverizers, dust-collectors, and other powerhouse equipment. Discussions of air conditioning equipment, portable electric tools, and elevators are equally detailed.

First half of the instrumentation section is devoted to non-electrical gear such as recorders, thermometers, and pressure gauges. The second half is a concise, straightforward chapter on techniques of voltmeters, ammeters and wattmeters. Sections on buildings, mechanical equipment, lubrication, welding, electric trucks, stores control, sanitation and housekeeping, and corrosion, complete this hefty volume.

For those electrical engineers in industry who are responsible for any area of maintenance, this book should be indispensable. It will be a valuable volume for all powerhouse personnel, whether utility or industrial em-

(*Continued on page* 102)

It takes KEARNEY QUALITY in Fuse Links to give you maximum service continuity



Strictest quality control . . . from design through final inspection . . . guarantees that all KEARNEY Fuse Links of the same rating will perform exactly alike.

ALL KEARNEY Fuse Links feature low temperature operation. Pure tin elements or low melting point solder keep temperatures inside the cutout tube well below charring point. You can be certain of positive arc clearance even after long periods of overload.

Wherever service continuity demands the best . . . in Specialized or Standard Fuse Links . . . the choice is KEARNEY! Contact your KEARNEY Representative.

Extensive, continuing tests made at KEARNEY's own high voltage Sub-station duplicate field conditions; assure fuse link accuracy.

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SAFER MAINTENANCE
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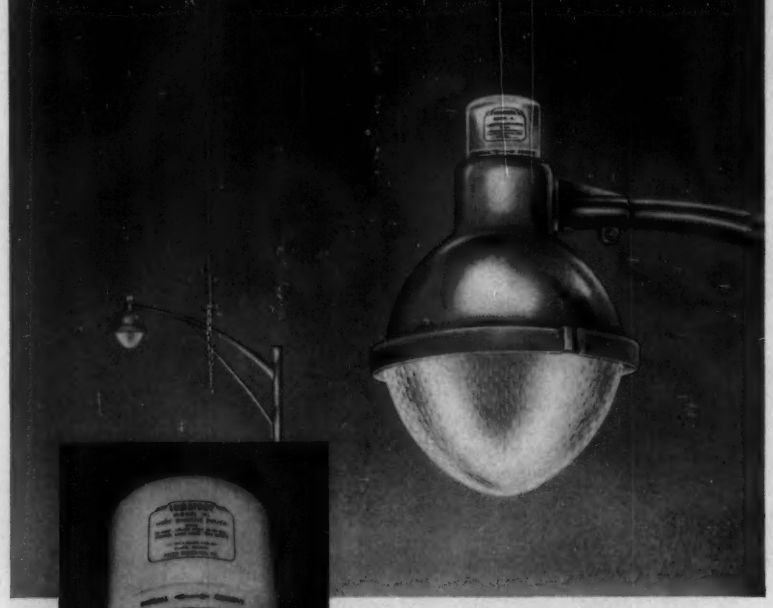
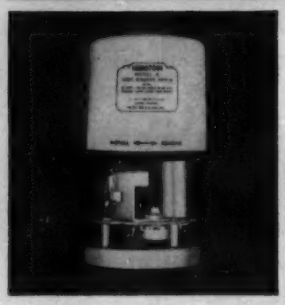
Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IA. —GUELPH, ONT., CAN.

TUBELESS
STREET LIGHTING CONTROL





You can solve most of your street and highway lighting control problems with the new LUMATROL® MODEL R TUBELESS AUTOMATIC LIGHT SWITCH. That's because most control troubles are directly traceable to vacuum tubes.

LUMATROL® MODEL R achieves maximum reliability by sensing light with a hermetically sealed cell instead of the usual Phototube, and using a plug-in Electrostatic Relay in lieu of a conventional vacuum tube for switching the circuit.

Installation is simple and inexpensive on any luminaire, cross-arm or pole. Maintenance is negligible, as proved by installations in every climate. The unit is weatherproof and will not crack or discolor. It is lightweight and small in size: 4" dia. x 3⅞" high. Just 20 ounces!

WRITE, CALL OR WIRE FOR LUMATROL MODEL R BULLETIN 101

micro balancing
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Books

(*Continued from page* 101)

ployees. Much of the material on electrical maintenance may be useful in training programs. Because of a heavy emphasis on proper selection of equipment to reduce maintenance, utility power salesmen will find many of the chapters highly useful background material.

Computer Primer for Executives

Management Guide to Electronic Computers. By William D. Bell. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 391 pages illustrated. Price $6.50.

Electronic computers are apt to be a strange, unknown subject to most laymen, including men of management. The author accepts this as a basic premise in setting out to acquaint executives with electronic computers, how they work, and their capabilities and limitations. Simple analogies describe a computer as an efficient, accurate, and rapid calculating machine, and not as a mysterious electronic "brain". Components are discussed with enough technical detail to satisfy the non-technical reader without burdening him with unfamiliar terms. Advantages and disadvantages of each type of separate component are stated clearly. The reader, as a prospective purchaser, is in a better position to evaluate his real needs for a computer and what type of equipment will best meet them.

Eleven case histories of computer applications help to explain the capabilities of technical, one-purpose computers and business, general-purpose computers. Simple, functional illustrations contribute to an easier gasp of the subject.

Books Received Since June 28, 1957

Basic Mathematics for Electricity, Radio, and Television. **By Bertrand B. Singer. Published by McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 36, N. Y. 497 pages, illustrated. Price $7.50.**

Engineers' Bibliography on The Design and Operation of Cooling Towers. **By Paul M. Mason, Robert E. Betts, and Wesley W. Smith. Published by Texas Engineering Experiment Station, College Station, Texas. 71 pages.**

Medium Size Transformers. **By Samuel Heller. Published by Datarule Publishing Company, Box 69, Scarsdale, New York. 208 pages, illustrated. Price $25.00.**

Mathematics for Science and Engineering. **By Philip L. Alger. Published by McGraw-Hill Book Co., 330 West 42nd Street, New York 36, N. Y. 334 pages, illustrated. Price $6.95.**

Corrosion and Wear Handbook for Water Cooled Reactors. **Edited by D. J. Depaul. Released by the U. S. Atomic Energy Commission. 293 pages, illustrated.**

SALES ASSIGNMENTS

COMPANY STAFFS

Allis-Chalmers Manufacturing Co's Industries Group has appointed Robert B. Fulton as manager of the new Dayton district office. William F. Vander Mass becomes manager of the Cincinnati district and James A. Sudduth manager of the Grand Rapids district . . . C. C. Jordan has been named Southeast regional representative for power plant equipment, Industries Group . . . The recently organized A-C International has made the following appointments: W. J. Holmes, manager of sales; J. C. Warner, territorial sales manager, Middle and East Asia, Oceania; D. W. Arendt, territorial sales manager, Africa, Europe and Near East; Ladis Pinilla, regional sales supervisor, South America; George D. Sheriffs, regional sales supervisor, Mexico, Central America, Caribbean area.

Kaiser Aluminum & Chemical Co's new Electrical Conductor Division has named the following regional managers: J. W. Loveland, Northeastern, with offices in New York City; W. J. Lawrence, Southeastern, Philadelphia; H. B. Stauffer, Great Lakes, Cleveland; J. G. Johnson, North Central, Chicago; E. K. Matteson, South Central, Kansas City; and L. M. Guibara, Western, Los Angeles.

United States Steel Corp's American Steel & Wire Division has advanced Norman M. Sted to central area manager of sales to succeed Howard B. Maguire, now general manager of sales for the division. From headquarters in Cleveland, Sted will direct sales activities in six districts: Buffalo, Cincinnati, Cleveland, Columbus, Detroit, and Pittsburgh . . . Myron E. Capouch becomes assistant general manager of sales and Bruce D. Bennett, manager-construction material products sales for the division.

REPRESENTATIVES

Automatic Switch Co has appointed Air & Hydraulic Equipment Co of Hackensack, N. J., as authorized stocking distributors of Asco solenoid valves for the area.

Dossert Manufacturing Corp, Brooklyn, N. Y., has appointed Osgood & Associates of Atlanta, Georgia, as representatives in the state of Tennessee.

Fisher-Pierce Co has named L. R. Ward Co of Dallas and Houston as representatives in Oklahoma and the Amarillo and Panhandle sections of Texas.

Four Wheel Drive Auto Co has designated Motor Fleet Service of Indianapolis to represent FWD as sales, parts, and service dealer in Boone, Hamilton, Hancock, Shelby, Johnson, Morgan, Hendricks, and Marion Counties in Indiana. J. D. Motor Service of Houston is new FWD parts and service dealer in Harris County, Tex.

positive protection without gadgets...

through KEARNEY double-venting action

TYPE "G" TRIPOUT

Fused with standard buttonhead links, the KEARNEY Type "G" will clear the full range of overload and fault currents without the use of special gadgets. To restore the Type "G" to service, only the fuse link needs to be replaced.

Top vent directs expulsion gasses harmlessly away from other live equipment. Cartridge recoil from top gas jet keeps upper contact closed during arc interruption. Patented, full-floating top contact eliminates contact burning, maintains high contact pressure until arc is extinguished and cartridge drops out. Never needs adjusting . . . weather-protected by cast bronze hood.

Contact your KEARNEY Representative for the Type "G" engineered to meet your load and fault conditions *precisely*.

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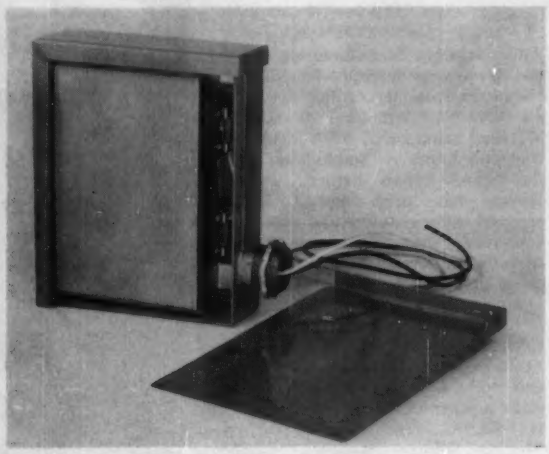
for BETTER CONSTRUCTION SAFER MAINTENANCE *Specify* KEARNEY PRODUCTS

Plants at ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IA. — GUELPH, ONT., CAN.

With capacitors for Socket . . .



Or adjacent mounting . . .

Sangamo Corrects PF at Meter Box

Sangamo Electric Co has developed a line of secondary power capacitors for installation at the meter box. The Springfield, Ill., firm's extensive market research has found that a number of large utilities are interested in a more economical method of installing secondary capacitors at a point nearest loads requiring power factor corrections.

Models of the capacitors have been shown to many utility engineers and approved by them. Sangamo is tooling to produce the units early in the Spring of 1958.

The capacitors will carry the name Secovar. Two types and three sizes will be available. The type S will be in 1.5- and 2-kvar sizes and can be inserted into the conventional meter socket. It will also receive and make proper connections to a socket-type meter. The type N will be a 1-kvar unit and have an adjustable bracket for mounting and a nipple for a meter-connection box or a rectangular meter socket. Capacitors are connected to the line side of the meter terminals.

Both types will be for outdoor or indoor installation. A fuse in each lead provides protection in event of either line or ground faults.

Anticipated price of the Secovar units will be about $15 per kvar, according to the manufacturer.

Here's a Peek at New Products

• Side Break Switch, group operated, rated 2,000 amp and up to 115 kv, has enclosed hinged contact. Memco Engrg & Mfg Co, Commack, N. Y.

•Corrugated-Metal Sheath Cable, known as C-L-X, provides a sealed conduit with "built-in" cable, for cable cores up to 3.5 in. Simplex Wire & Cable Co, Cambridge 39, Mass.

• Far Infrared Camera, for thermal photographs; points on photographic image indicate the heat being emitted by that point and can be converted into temperature readings; applicable for transformers, switches, conductors, power plants. Barnes Engineering Co, Stamford, Conn.

• Synchro Switch, for automatic switching of street lighting circuits, uses cadmium selenide photocell, synchronous motor, and switch. Tuttle & Bailey, New Britain, Conn.

• Interlocked Armored Cable, with 600-, 5,000-, and 15,000-v ratings and galvanized steel, aluminum, or bronze armor. Rome Cable Corp, Rome, N. Y.

Price and Monteith to Give Keynote Address at NEMA

Two top industry executives will join in presenting the keynote address at the 31st annual convention of the National Electrical Manufacturers Association, advises Joseph F. Miller, NEMA managing director. The convention opens Nov. 11 at the Traymore Hotel, Atlantic City, N. J.

The speakers, both from Westinghouse Electric Corp, are Gwilym A. Price, chairman of the board and president, and A. C. Monteith, vice president, Apparatus Products. Price will pose the long range prob-

(*Continued on page* 106)

MEN RESPONSIBLE FOR

POWER DISTRIBUTION KNOW...

IF IT'S PARANITE IT'S RIGHT!®

FROM AERIAL TO UNDERGROUND CABLE . . .

Paranite has a cable specifically engineered to meet your most rigid requirements! Super-Pararite® butyl rubber insulations have been developed to withstand special conditions in *your* area. Copper or aluminum bare or weatherproof cables — ACSR or line wire (formerly products of Midland Wire Corporation) are available.

PARANITE WIRE AND CABLE

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MANUFACTURING PLANTS: *Birmingham, Ala.; Anaheim, Calif.: Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio

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Atlanta, Georgia
*Chicago, Illinois
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Signs along the lines of
Crapo GALVANIZED STEEL STRAND PERFORMANCE
For dependable performance . . . insist upon Crapo Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes Crapo Steel Strand first choice for guys, messenger and overhead ground wire.
The famous Crapo galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.
• Low maintenance cost
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• Meets highest quality standards
• A size and grade for all practical needs
• Contact your Crapo Jobber—Today!
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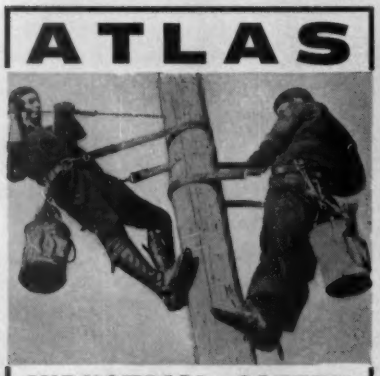
Muncie, Indiana



INDUSTRIAL SAFETY EQUIPMENT

security designed for the job . . .

Safety Belts & Straps, Harnesses, Lanyards, Rope Safety Nets and Ladders, Axes insulated for 20,000 Volts

for: Linesmen, painters, electrical, bridge, construction and marine workers, window cleaners and tree surgeons.

Available in leather and web.

All hardware drop forged, tested.

Write for complete literature on our safety equipment line

ATLAS SAFETY EQUIPMENT CO., INC.
177 N. 10th St. Brooklyn 11, N. Y.

Price and Monteith

(*Continued from page* 104)

lem facing management in matters of administration and profits in an economy where the demand for goods and services is growing faster than the labor force. Monteith will offer the solution in his talk—"190,000,000 Dissatisfied Americans."

The unusual two-part presentation, scheduled for the membership luncheon meeting on Nov. 12, will point up the opportunities for the electrical industry to assume the lead in answering this No. 1 problem for American manufacturers.

The annual business meeting of the Association will follow the Nov. 12 luncheon. Featured will be the election of new members to the NEMA board of governors; address by NEMA President A. A. Berard, and the adoption of the Association's 1958 program and budget.

The 50-year certificates will be presented to three veterans of the electrical manufacturing industry: Victor R. Despard, vice president, Pass & Seymour, Inc; D. J. O'Conor, Sr., chairman of the board, The Formica Corp; and Edward F. Sixtus, vice president, Federal Pacific Electric Co,

In accordance with established custom, the name of the recipient of McGraw award will not be announced in advance of the presentation.

Disston Saws Get Power

Henry Disston Div of the H. K. Porter Co, Inc, has entered the power tool field with an electric hand saw. It is the first of a complete line to be introduced during the next 14 months.

The electric sabre saw that leads off is named the Disston D-23, after its century-old predecessor, the D-23 hand saw. It is designed to cut metal, plastic or wood.

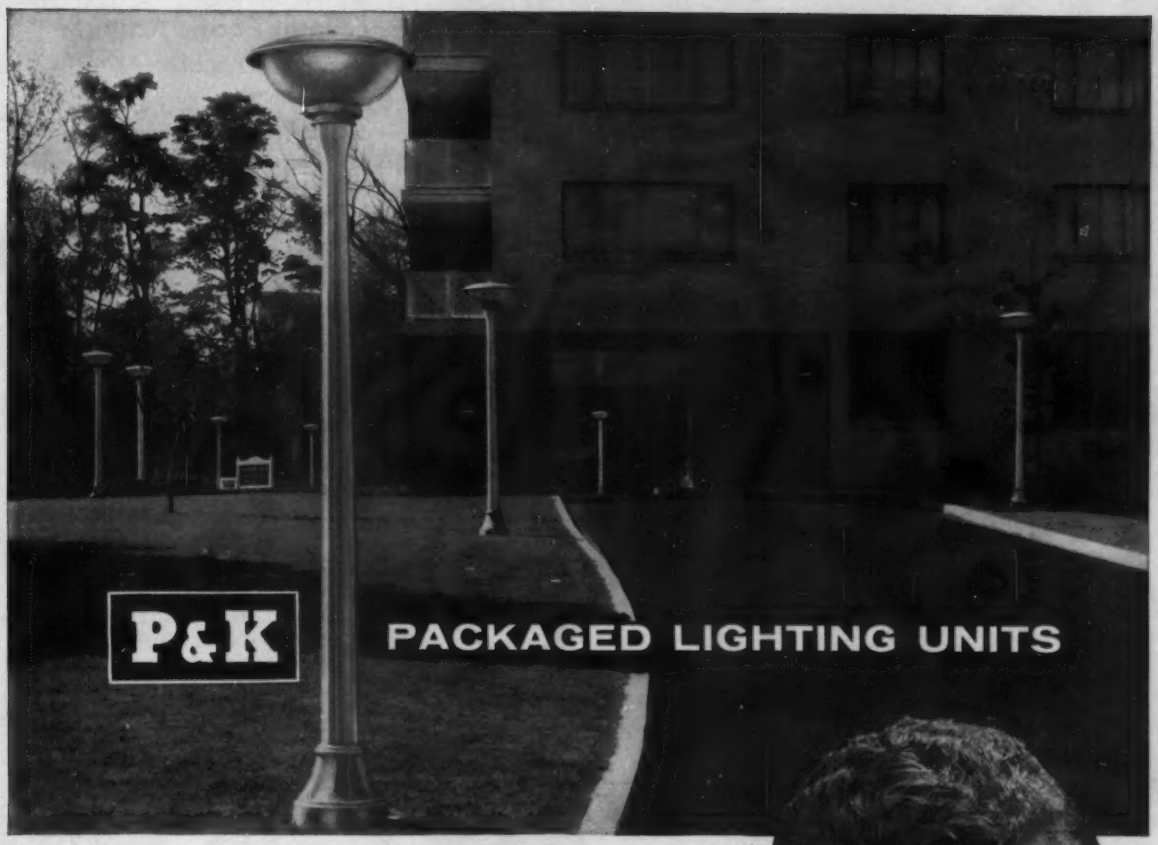
Two-Cab Vehicle Carries Transformers

A 36-wheel tractor-trailer was used recently to transport three transformers. Its front and rear steering is like a fire department aerial ladder truck and the two cabs are connected by an intercommunication system. Each transformer is rated 40,000 kva, 13.2-241.5 kv, single-phase, and weighed 86,000 lb without oil.

The 130-ton capacity, 53,000-lb rig, built by Peerless Trailer & Truck Service Inc, Portland, Ore., was completed early in August. This specially built conveyance was employed by Wilhelm Trucking Co, Portland, to transfer the Westinghouse transformers for Portland General Electric Co.

Each transformer was hauled separately over a 12-mile route from a railroad siding at Madras, Ore., to the Pelton hydro-electric project on the Deschutes River.

(*More M&M on page* 108)



make the job easier!

"When Harrison Park wanted to provide lighting for the grounds of their new luxury apartments—they chose P & K packaged units—in keeping with the handsome buildings and surroundings. Thus, from one source, they were able to select pedestal and lighting units, with such a wide choice in each that they effectively customized their installation with standard components."

For example, you can choose from a wide range of conventional designs—davit or straight—as well as many more advanced shapes for any particular lighting requirement for residential, commercial, industrial, and street lighting applications. Whatever you choose, P & K's seamless, tapered, all-aluminum construction assures high strength, ease of installation, and absolutely no maintenance.

YOUR CHOICE OF 3 LIGHT SOURCES

Yes, in addition, to matching standards or pedestals, you also select the light source best suited to your needs—incandescent, fluorescent or mercury vapor.

Harrison Park chose the P & K package unit consisting of a CIRCLElux incandescent post top unit, and a slim, tapered ten-foot aluminum pedestal.

How sensible to match components to form a packaged unit to your own specifications—achieving the effect you want with a minimum of cost and a maximum of convenience. Send today for your copy of the P & K catalog L-2.

P&K

PFAFF & KENDALL

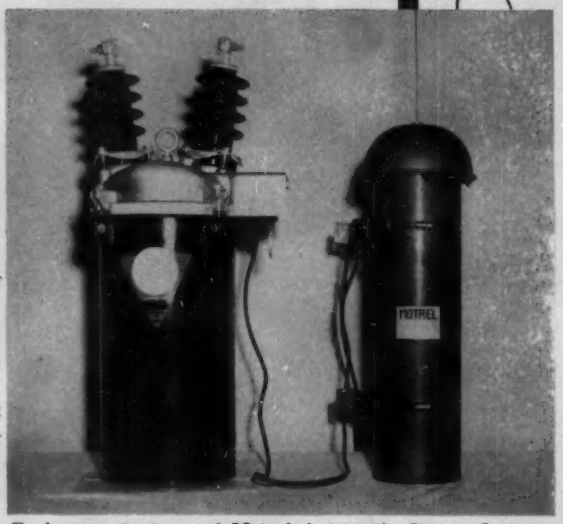
84 FOUNDRY ST., NEWARK 5, NEW JERSEY

"The greatest innovation since 2-way radio . . .

. . . We have made every test we can think of and can find no fault either in operation or in construction of the unit," says Karl Crawford, engineer, Wellington, Ohio.

MOTREL
Automatic Outage Locator
Identifies Power Failure
Instantly
via Space Radio

- Lightweight
- Easy to Install
- Inexpensive
- Saves Time
- Saves Manpower
- Creates Customer Good Will
- Reduces Line Congestion
- Operates Only at Time of Power Failure



Recloser, actuator and Motrel Automatic Outage Locator. FCC Docket No. 12028 permits utilities to engage in one-way signaling on mobile frequencies to indicate electric line outages.

Completely Automatic!

Motrel's Automatic Outage Locator is an FM Transmitter operated automatically in response to a tripped associated recloser, fuse or circuit breaker. Each sectionalizer equipped with an outage locator, transmits a distinctive coded signal which identifies that sectionalizer. This coded information is received directly by mobile units or base station. The locator provides maintenance with immediate notification of line failure . . . **without consumer participation.**

FOR INFORMATION WRITE:

MOTREL, INC.
P. O. Box 2521
Baton Rouge, Louisiana

MOTREL
INCORPORATED

Patent pending on Motrel Locating System

Federal Pacific Acquires Penn Electrical

Federal Pacific Electric Co, Newark, N. J., is acquiring all outstanding common stock of Penn Electrical Co, Irwin, Pa., in exchange for 20,600 shares of its common stock, according to T. M. Cole, Federal Pacific executive president.

Cole said the acquisition is expected to strengthen the company's market position in the Pittsburgh area. He explained that the purchase was a logical step in his organization's program to expand its national network of regional manufacturing plants.

Penn Electrical will continue, under present management, to manufacture switchboards and panelboards to specifications. Sales are principally in states east of the Mississippi River.

Federal Pacific manufactures electrical control, panelboards, switchboards, transformers and circuit breakers. The company's shares were traded at $18.75 on the New York Stock Exchange on Oct. 11 when the purchase was announced.

Directors Approve ESB's Acquisition of Ray-O-Vac

Directors of The Electric Storage Battery Co and the Ray-O-Vac Co of Madison, Wis., approved in detail recently a reorganization plan, calling for Ray-O-Vac to become a division of ESB Co.

The plan will be submitted to stockholders of both companies at special meetings in Philadelphia and Madison on November 19. It calls for an exchange of one share of ESB commonstock for two shares of Ray-O-Vac.

If the plan is approved, on or about November 20 Ray-O-Vac's business, properties, and goodwill will go to ESB in exchange for 555,747 shares of its stock. Ray-O-Vac will then distribute the stock pro rata to its own stockholders, and dissolve.

After the transfer, Ray-O-Vac business will be conducted by its present officers and employees. It will be known as the Ray-O-Vac division of The Electric Storage Battery Co.

This Pneu-Draulic operated breaker is mechanically trip-free for positive protection

Get more positive protection with Allis-Chalmers mechanically trip-free breakers

Contacts are always free to open at full speed in Allis-Chalmers mechanically trip-free breakers. Contacts and closing mechanism are always completely uncoupled during tripping operation, enabling contacts to open without restriction from mechanism. Breakers that are only pneumatically or hydraulically trip-free cannot give you this protection.

Pneu-Draulic is an Allis-Chalmers trademark.

Get details on this and other features of Allis-Chalmers breakers. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS

A-5242

Allis-Chalmers Unit Substations designed for continuity of service

You get these features

- 5-cycle breakers — reduce conductor burndown.
- Flame retardant insulation — reduces secondary fire hazard.
- Gasketed weather-proof doors — seal against dust, moisture and vermin.
- Time-proven load tap changer — provides dependable voltage regulation.

In addition, quiet transformers plus low profile make these units more acceptable in neighborhood locations.

A-5258

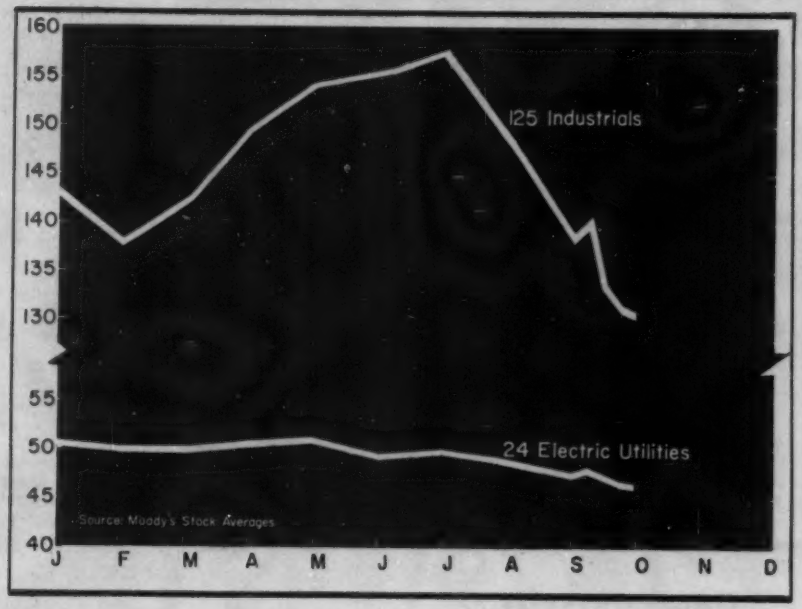
Ask for Bulletin 1187912

For help on your substation problems, call on A-C specialists. Contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS *for progress in switchgear*

ELECTRICAL BUSINESS OUTLOOK

Electrical World
NOVEMBER 4, 1957



Sagging Stocks Exaggerate Business Lull

Business conditions are not as bad as the stock market makes them look. But it's still hard to write off three months of declining common stock prices as just a case of jitters. The worst break in the market since mid-1949 naturally prompts the question: "What happened?"

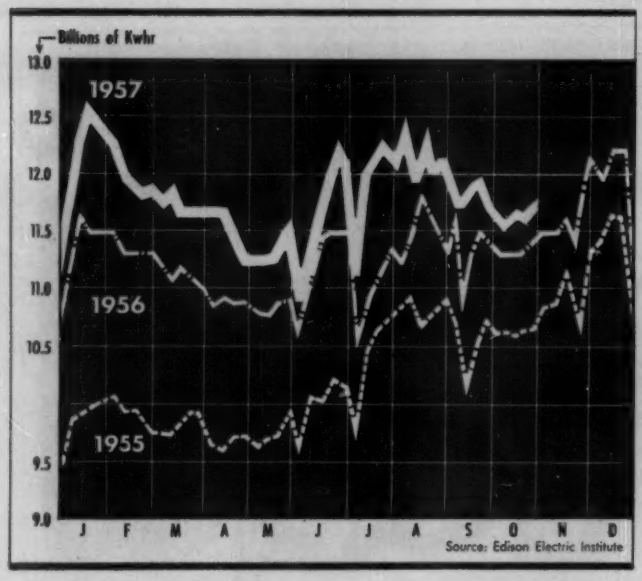
Nobody in Wall Street is giving unqualified answers to that question. Many factors have been throwing their weight around in the market—all the way from Sputnik to second guessing about the future course of tight money. The profit picture has been spotty this year, and dividend cuts have been in the news of late. And, of course, stock prices have been especially high as measured by such conventional yardsticks as price-to-earnings ratios.

What Wall Street really reflects is a let-down in business confidence over the last few months. You get a clue as to what's been taking place from the latest batch of economic indicators. Last month production, employment and personal income all dropped off a shade. Actually these changes were too small to add up to much, but they did come at a time when most everyone was looking for signs of a 4th quarter pick-up.

How general the disappointment was showed up in utility stocks, which also have lost ground in recent weeks. This has been particularly true of those growth utilities whose value had soared along with the bulk of common stocks. The big break of October 21 even affected the old income-earning stand-bys that usually follow the bond market. Although they promptly vindicated their good reputation as defensive holdings with a sharp rebound, the downward trend continued. Utility stocks still stand well below their summer levels.

What the stock market will do now is the $64,000 question (now down to $51,000 on the Big Board avgs.). One thing is clear. The recent drop on the stock-market barometer far overstates what has actually taken place in the economy. We've had a levelling off, but business is still running strong. And that goes double for utilities.

STATISTICS



OUTPUT

Week ended October 26,
11,787,000,000 Kwhr
Up 3.5%

Per Cent Change From Previous Year

	Oct. 12	Oct. 19	Oct. 26
Total U. S.	+3.6	+3.1	+3.5
New Eng.	+6.6	+5.8	+1.8
Mid. Atlan.	+3.5	+2.5	+2.5
Cent. Ind.	+1.4	+2.6	+7.2
West Cent.	+5.5	+6.2	+5.3
Southeast	+4.7	+4.5	+4.5
South Cent.	+1.3	+1.5	+0.0
Rocky Mount.	+3.2	−0.3	+2.4
Pacific			
NW	+3.8	+1.4	+3.9
SW	+7.7	+2.9	+3.5

Seasonally Adjusted Index 226.8
Week Ago 226.4
Year Ago 229.2

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 4.6%

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Aug.	125.75	124.99	118.01	6.6
Peak—Class 1 Systems (million kw)	June	104.6	97.8	97.2	7.6
Estimated Dec. '57 Peak (million kw)	Aug.	113.0	113.2	114.6	−1.4
Production—billion kwhr	Aug.	55.45	54.35	52.19	6.2
Hydro		10.03	10.81	9.54	5.1
Fuel		45.42	43.54	42.66	6.5
Sales—billion kwhr	July	48.09	46.99	44.60	7.8
Residential		12.59	11.91	11.42	10.2
Commercial		8.54	7.90	7.75	10.2
Industrial		24.07	24.64	22.76	5.8
Other		2.88	2.54	2.67	7.9
Fuel Consumption	Aug.				
Coal—million tons		13.33	12.72	13.18	1.1
Oil—million barrels		5.79	5.51	5.18	11.8
Gas—billion cu ft		160.96	158.91	142.04	13.3
Net Income Class A & B Co's $—million	Aug.	108.86	100.92	96.45	12.9
Residential Customers—millions	12 mos	46.35	46.26	45.09	2.8
Revenue per kwhr	ended	2.58¢	2.58¢	2.61¢	−1.1
Avg kwhr per customer	July 31	3,082	3,063	2,900	6.3
Avg annual bill		$79.52	$79.03	$75.69	5.1

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Sept.	146	144	146	n.c.
ENR Construction Cost	Oct.	154.5	154.7	147.6	4.7
BLS Cost-of-living	Sept.	121.1	121.0	117.1	3.4
New Orders for Machinery (1950 = 100)	Aug.	134	147	142	−5.6
NEMA Sales					
Insulation materials	Aug.	134	127	153	−12.4
Electric appliances		86	101	100	−14.0
Wholesale prices	Sept.				
Motors and generators		142.4	142.6	136.2	4.6
Transformers and regulators		150.6	150.6	144.8	4.0
Switchgear and fuses		169.5	166.9	157.0	8.0
GNP—annual rate—$ billion	3nd qtr.	439.0	434.3	416.7	5.4

MANAGEMENT BULLETIN

FINANCE ▶ **After several months of relative stability,** the equilibrium of the market for new offerings of utility funded debt has finally been disturbed by the recent declines and frantic gyrations of the stock market.

The new market conditions were reflected in the 4.99% yield basis paid by underwriters for the double "A" rated Consolidated Edison Co of New York bond issue offered on October 23. This compares with a yield of 4.83% paid for the similarly rated Gulf States Utilities Corp bond offering which came to the market about Oct. 1. A contributing factor in producing the high yield for the Con Ed bonds was the overhang of the market by the $250 million American Telephone & Telegraph Co debenture issue which was then scheduled for offering about a week later.

It is to be hoped that calmer conditions will prevail in the stock market and that the new issue market may regain its former levels after the pressure of the "Big Telephone" offering is removed.

Brockton Edison Co which had a block of 30,000 shares of new $100 par preferred stock up for competitive bidding did not receive a single bid. Company is now asking the Massachusetts commission and the SEC permission to sell it privately. Company also postponed temporarily invitations to bankers to bid on a $3 million bond issue scheduled for Oct. 30.

Terrell, Texas, City Council voted at the third reading to sell the city's municipal power system to Texas Power & Light Co and grant the company a franchise. Citizens had already voted on the proposition and approved the sale.

Wisconsin Public Service Corp common stock issue went well. Company says that its offering of 253,494 common shares to its stockholders at a price of $18.50 a share was 95% subscribed. After allotment of shares for employees' subscriptions, balance of 2,278 shares was taken by the underwriters.

Issuance of 200,000 common shares has been postponed temporarily by Tucson Gas, Electric Light & Power Co due to "unsatisfactory market conditions." Adam Schantz, head of Adam Schantz Inc, one of the company's largest stockholders, earlier had protested the issue saying it should be offered to present stockholders before being offered the public.

RATES ▶ **Pacific Gas & Electric Co has won a 5.16% rate increase** expected to add $16,967,000 a year to revenues. California Public Utilities Commission estimates that the hike will give PG&E a 5.75% rate of return.

PUC denied PG&E's request for an escalator clause that would allow electric rates to fluctuate with the cost of fuel for steam plants (which generate two-thirds of the company's power). Commission said such clauses may have a place where competitive conditions have to be met, but that is not the case here.

Commission agreed in this case as did in the recent Southern California Edison Co case that it was okay for the companies to normalize federal income taxes for rate-making accounting on properties acquired under five-year accelerated amortization certificates, even though paying taxes based on a five-year "write-off", because this program of granting certificates has come to an end. But, though it refused to rule now on whether the companies could normalize federal income taxes for rate-making accounting if they elected one of the liberalized depreciation methods legalized by federal income tax changes in 1954, it implied strongly it might lower the rates if this were done.

Rate increase granted is based on straight-line depreciation, and it will have to be changed if PG&E elects to take accelerated depreciation, the commission said. Order also put a stop to agricultural conjunctive billing.

MANAGEMENT BULLETIN continued

EMPLOYEE RELATIONS ▶ **Two companies sign labor contracts.** Public Service Co of Colorado and IBEW agree to a 5½% wage increase retroactive to June 1, 1957, plus a medical plan and a group insurance plan. Contract runs to May 31, 1958 . . . A contract awarding a 3½% across-the-board increase to 10,500 workers of the Hydro-Electric Power Commission of Ontario has been signed by the Ontario Hydro Employees Union. Contract, retroactive to April 1, involves increases ranging from 5¢ to close to 20¢ an hour. Linemen and electricians had their hourly rates increased from $2.20 to $2.28.

CONTRACT ▶ **New wheeling contract has been signed** between the Georgia Power Co and Southeastern Power Administration for the Interior Department. The 10-year pact (runs until July 28, 1968) is basically an extension of the Clark Hill contract to include Buford (86 Mw) and Allatoona (74 Mw) projects built by the Corps of Engineers. Clark Hill is rated at 280 Mw. But only half of Clark Hill's capacity is involved, because it is a split equally between Georgia and South Carolina.

Under the new contract, the government agrees to pay Georgia Power for wheeling energy to preference customers. These customers must contract individually with the government for their allotments and with the company for the balance of their requirements. The government does not contract to supply all the needs of the preference customers.

Of the available usable power, preference customers get the first 141 Mw and 635 million kwhr per year and pay a composite rate of six mills per kwhr. This rate is based on $10.98 per kw yr and 3.56 mills per kwhr.

Georgia Power gets 106 Mw of dependable power and associated energy at a cost of 91.5¢ per kw mo and 2.96 mills per kwhr. Moreover, the company may receive any dump energy at two mills.

For wheeling the power to the preference customers, Georgia Power is paid a flat fee of $65,000 per month by the government. Previously under the Clark Hill pact, the wheeling fee was based on amount of energy and distance to the preference customer. There are 50 public groups and 39 rural cooperatives that are entitled to the power.

PUBLIC RELATIONS ▶ **To better inform customers about interruptions,** planned or otherwise, district managers of West Penn Power Co are guided by a publicity kit of materials and ideas. The material covers public relations opportunities in unplanned (emergency) interruptions and suggests ways to obtain the greatest possible public credit for construction work involving planned outages. The kit includes sample news stories, special newspaper insert orders, a radio commercial for a planned outage, and rosters of press and radio people in each district.

A "film folder" has been issued by Connecticut Light & Power Co. It lists a number of films that are available to people in the service area of the company, for showing to civic and service clubs, church societies, schools, granges, and similar organizations. If you are interested in seeing a listing of the films that are available, write the company at New Berlin, Conn.

A history of Detroit Edison Co is to be published early next year by Wayne State University. Compiled by Prof Raymond Miller, head of the university's history department, the book will comprise a series of anecdotes about the company to express Detroit Ed's philosophy. After five years working on the book, Prof Miller reached a conclusion stated in the text (and adopted as the slogan of the Electric Companies Public Information Workshop held recently in Detroit): "The alternative to public ownership is public confidence," Miller wrote. This, he believes, is among Detroit Ed's most important underlying philosophies.

Do you worry about the cost of wiring that new power distribution system

ON A SUNDAY AFTERNOON?

Sure, new power systems cost plenty — and it takes close figuring to get maximum results at reasonable prices. But you don't have to worry about getting dependable wiring at the right price — an armored cable and rack system using Rockbestos A.V.C.* Interlocked Armored Cable is your best solution. Here's why:

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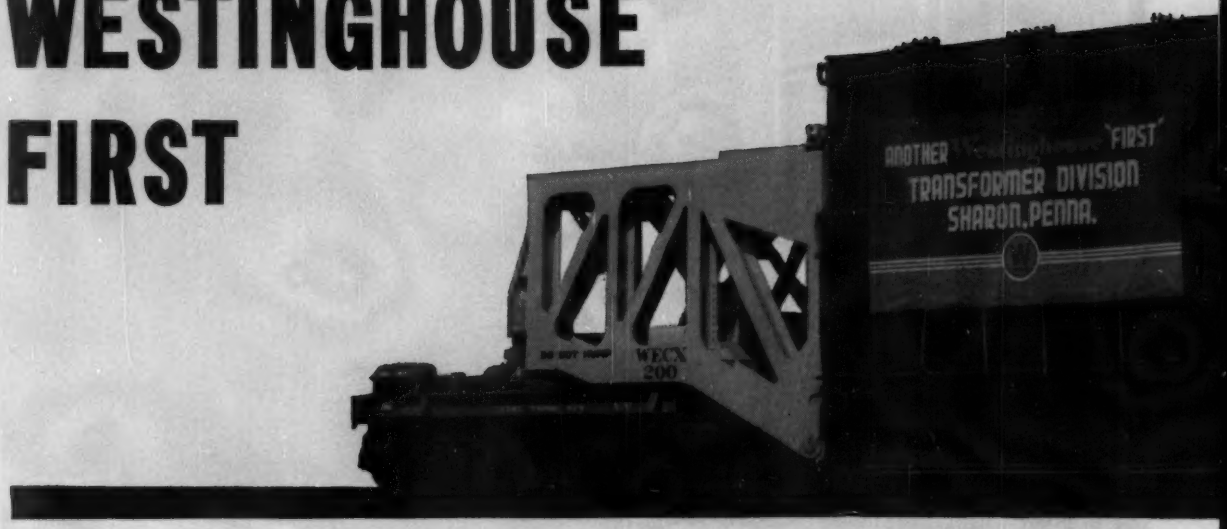
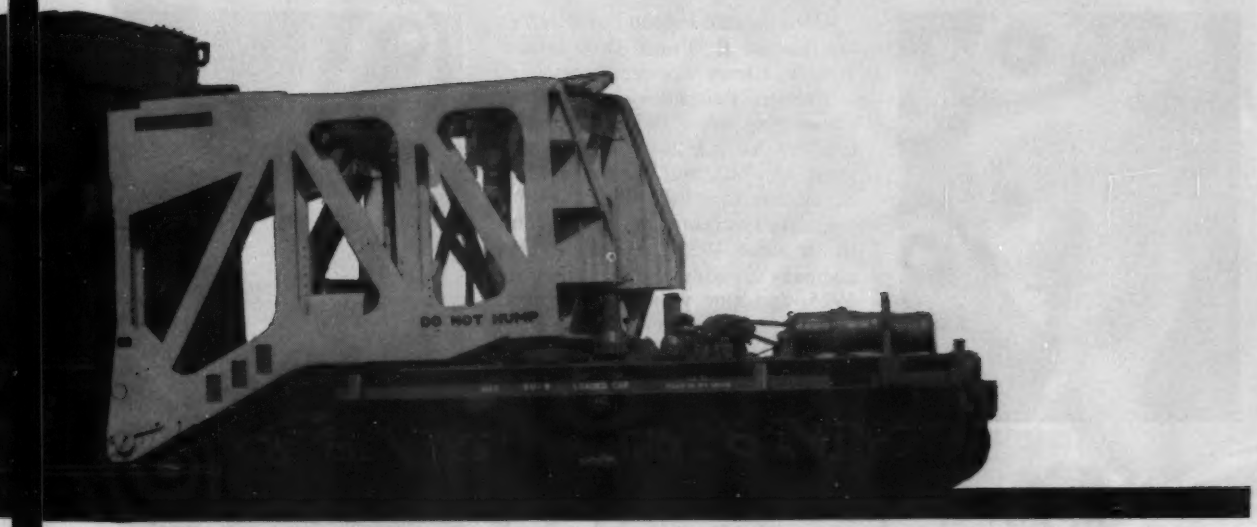


NEW SHIPPING METHOD DELIVERS GIANT TRANSFORMER

For the first time, a transformer has been shipped as part of its own railroad car! En route to the Ohio Power Company's Kammer plant at Captina, West Virginia, this 200,000-kva, 330-kv autotransformer became the center section of a revolutionary three-section railroad car—the nation's first car of this type.

Designed by Westinghouse and built by the Greenville Steel Car Company, the new car will permit transformers up to 250 tons to be shipped in one piece—upright, and without sectionalizing.

The new car consists of two identical end sections, with the transformer comprising the center section and suspended between trusses mounted on each end. Although the car is 90 feet long when



AS PART OF CAR, REDUCES INSTALLATION TIME AND COST

loaded, it can negotiate the same curves as a standard boxcar. The result: direct routing, helping to speed your construction schedules.

The combination of this new shipping method and Westinghouse "Form-Fit"® design provides a sure means of producing transformers with ratings adequate for future needs. Utilizing basic shell-form design with the core surrounding the coils, Form-Fit design provides a more compact transformer with superior mechanical and dielectric strength, greater thermal capacity—the highest rating-per-pound available. The new railroad car adds *extra* growth potential to this "room-to-grow" design, by providing assured delivery for your higher capacity transformers of the future. J-70828

YOU CAN BE SURE...IF IT'S
Westinghouse

The new railroad car can support its load only six inches above the rails—two feet lower than on a depressed-center car. For this delivery, top clearance was sufficient to permit suspension a full foot above the rails.

Untight squeeze—loaded on the new car, this transformer for Ohio Power Company stands 19'2" above the rails; bridge clearance here is 20'4"; net, 14" top clearance. This allows direct routing, speeds delivery and construction schedules.

Consolidated Edison Elects Two VPs

Consolidated Edison Co of N. Y. has elected R. Frank Brower and John V. Cleary vice-presidents.

Brower, assistant vice president-engineering since 1952, joined the old New York Edison's test department in 1920, and became system engineer of Con Edison in 1940.

Cleary has been Con Edison controller since 1953. He joined the company's auditing department in 1925, and nine years later became fixed capital engineer of both New York Edison and United Electric Light & Power Co.

CLEARY

BROWER

EEI Gets Economics Head

Edison Electric Institute has made Walter B. Gesell director of economics "on a short term basis" to head EEI's new economics department, reports Edwin Vennard, managing director.

After more than 40 years in the electric utility business, Gesell is retiring as vice president in charge of operations for the Oklahoma Gas & Electric Co. He began his career as an assistant engineer with the Milwaukee Electric Railway & Light Co, and after two years in the army during WWI joined the Wisconsin Railroad Commission as a case investigator.

After 16 years with Byllesby Engineering and Management Corp, Chicago, he moved in 1939 to OG&E as an executive assistant. In 1947 Gesell became VP and assistant to the VP in charge of operations, and two years later succeeded to the latter position.

WALTER B. GESELL

Georgia Power Ups Lastinger, Warner

Georgia Power Co has elected John W. Lastinger vice president in charge of public relations and advertising. Into Lastinger's present post of VP and Valdosta Division manager will move C. W. Warner, Valdosta Division operating manager. Changes are effective Nov. 1.

Lastinger joined Georgia Power & Light Co in 1929, and became president in 1950. When the company was sold earlier this year, he moved to his present post.

Warner, former VP of GP&L, joined Georgia Power early this year.

WARNER

LASTINGER

"Five...four...three"...

Two seconds to "FIRE"...the time when your instrumentation cables must work

Are you responsible for any of the equipment involved in scenes of this kind? Any of the instrumentation or telemetering devices?

If so, you well know how little can be left to chance when a $100,000-plus pre-dawn "shot" is scheduled.

Even minor cable trouble at a time like this can be crucial and costly, especially if it happens on the equipment involved for which *you* are responsible.

That's why it's important for you to insist on electronic cables with *maximum built-in reliability*.

Quiz yourself on cable

Here's how to get this kind of reliability. Ask yourself these questions about the cable that's to go into your own equipment:

1. Who is the cable supplier? Has he:
   a. Thorough knowledge of electronic wiring problems?
   b. Engineering and research skill in developing special cable?
   c. Complete facilities for producing custom-built or specification cable?
2. Are his cable conductors full-size, uniformly annealed and precisely stranded?
3. Are his insulations and coverings uniformly applied compounds that have proved workable, dependable?
4. Can he supply those newly developed materials that might be needed?

You'll find all of these qualifications met in full measure by Rome Cable

Millions of feet of Rome wire and cable have already been installed in electronic gear for military and commercial uses. More is ordered every day.

When you require cable that must not fail—or which must meet unusual specifications—we can very probably help you. Simply contact your nearest Rome Cable representative—or write to Department 422, Rome Cable Corporation, Rome, N. Y.

ROME CABLE

CORPORATION

Schultz Succeeds Blake in GE Post

N. R. SCHULTZ

Norman R. Schultz will succeed retiring David K. Blake as General Electric Co's manager of power distribution engineering, Engineering Planning and Development Section, User Industries Sales Dept.

Schultz brings to his new job a background of system analyses and application engineering problems in all phases of the electric power industry, most recently in power transmission engineering.

Blake's 41-year career at GE began when he was 19. After a grade school education he became operator of a power station. Two years later he went to GE, where over the years he has contributed to the development of network distribution systems, and unit substations.

D. K. BLAKE

PERSONAL BRIEFS

Consolidated Edison Co has promoted **Emanuel Toder** to controller, **Ralph F. Norris** to assistant vice president, and **John D. Gray** to assistant treasurer . . . Georgia Power Co will transfer **C. B. McManus, Jr,** to Valdosta as assistant division superintendent.

In new accounting posts at Virginia Electric and Power Co: **Warner W. Douthat, Jr,** supervisor of statistics section, tax and statistics dept; **James W. Rowe, Jr,** supervisor of the tax section; **Charles M. Jarvis,** district accountant (Richmond); and **William F. Fritsche, Jr,** district accountant (Fredericksburg area).

At Cleveland Electric Illuminating Co, **John R. Bruch** moves up to manager, Eastern Sales; **Thomas E. DyLiacco** to engineer system planning; **Leonard J. Gierosky** to engineeer, transmission & distribution; and **Robert H. Oerthel,** also to engineer, T & D.

J. N. Green is now a construction supervisor at West Texas Utilities Co . . . **Paul Beacham** is the new Mississippi Power & Light commercial salesman at Vicksburg.

Hobart Adams is the new Rural Electrification Cooperatives director for the Kentucky, Tennessee, Mississippi, Alabama area . . . **R. J. Panborn** will become chief electrical engineer, Arabian operations, the Arabian American Oil Co. **Donald E. Hughes** will succeed him as acting chief engineer for Cowlitz County (Wash.) PUD.

Karl Clinton is Niagara Mohawk's new Watertown district manager.

Retiring from Long Island Lighting: **William T. Brauer,** a supervisor in the customer accounting dept, after 32 years service.

PUD engineer **William A. Fell** has been serving as acting manager of Clallam County (Wash.) PUD since **Carl Miller** resigned recently.

Dr. Bernard I. Spinrad has been appointed director of the reactor engineering division, Argonne National Laboratory . . . Stone & Webster Engineering Corp has named **Arthur W. Davenport** project manager for Sao Paulo, Brazil.

Ebasco Services, Inc, has appointed **F. W. Ohles** manager, corporate finance dept . . . Anaconda Wire & Cable Co has made **P. Howard Farley** manager, distributor and contractor sales . . . **Raymond Knosen** is the new Norge laundry equipment district manager in Ohio, Pennsylvania, and West Virginia.

Recently named director of the health and safety laboratory of the Atomic Energy Commission was **Dr S. Allan Lough,** former deputy director.

Keasbey & Mattison Co has named **Robert M. Russell** supervisor of production and planning; **Charles R. Meek,** quality control manager; **Ralph L. Lanz,** planning and inventory dept manager; **Marvin R. Streepy,** assistant to the quality control manager; **William A. Endriss,** quality control supervisor of magnesia and industrial insulation products; and **Gerald F. Connell,** service-to-sales supervisor.

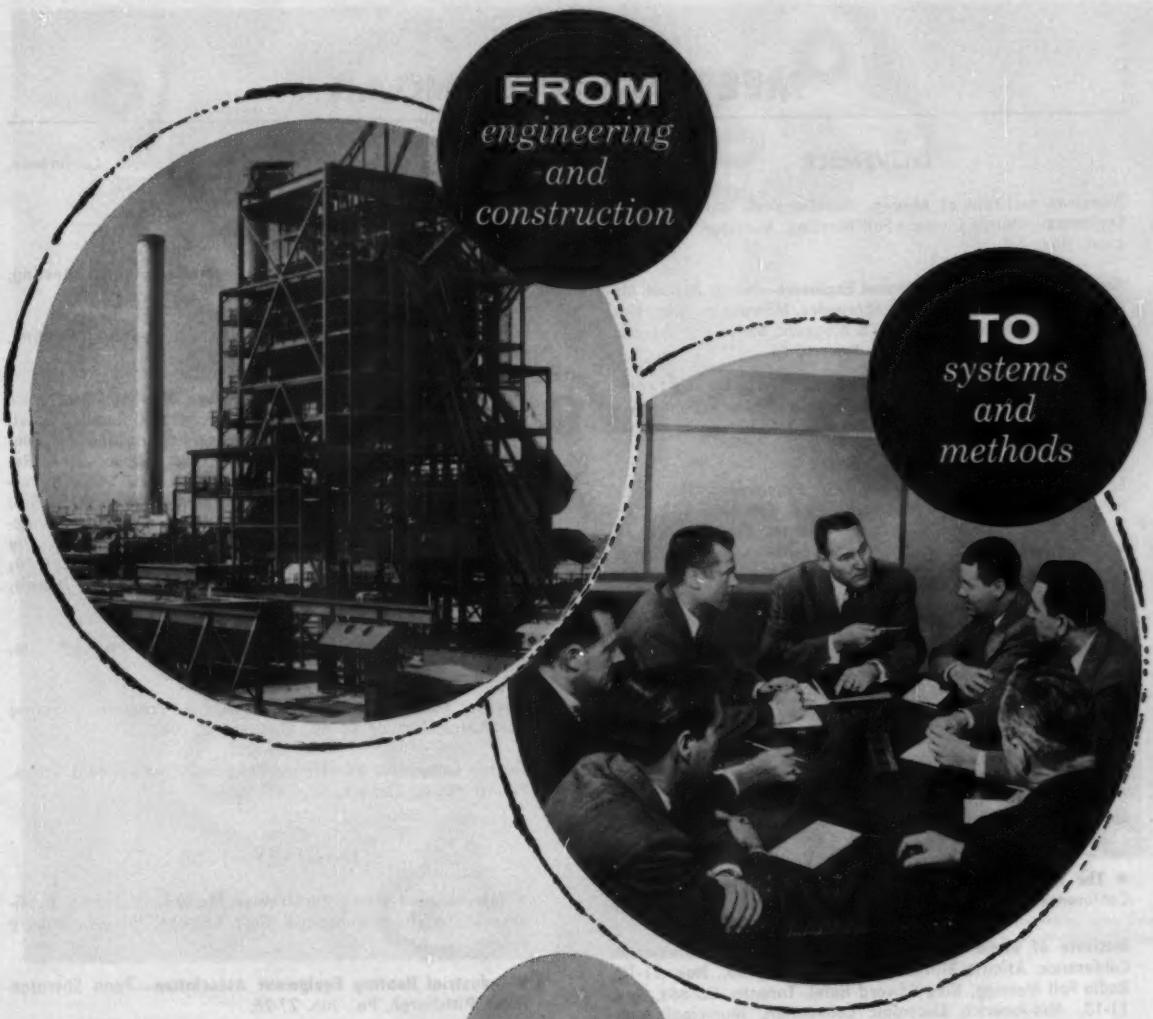
Westinghouse Electric Corp's Lamp Division has made the following appointments in its new organization formed to handle Rayescent lighting: **Carl F. Jensen,** to supervise all sales activities; **George B. Saviers,** to head manufacturing; **William J. Knochel,** engineering; and **Dr John W. McNall,** applied research. **Dr Henry F. Ivey** will continue to direct basic research.

Edward V. Diercks is new assistant to the general sales manager of Anderson Electric Corp . . . **Dr Mervin J. Kelly,** president of Bell Telephone Laboratories, Inc, has been designated as general chairman of the business and industry campaign for the new $10-million United Engineering Center planned for New York City.

Recently appointed vice president of Thomas & Betts, Ltd, in Canada was **Robert E. Bailey.** He is also managing director and secretary of the firm's Canadian operations.

Richard M. Clifford is new manufacturing manager of the Electrical Products Div., Corning Glass Works.

At Nordberg Manufacturing Co, the Engine Division has appointed **Robert F. Gibson** as manager and **E. Ray Hester** as assistant manager, installation and service dept.



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One of these services—*accounting and office systems and methods*—helps companies meet the challenge of ever-increasing complications and costs in this important area of operations. An Ebasco methods improvement program can help point the way to better service and lower costs for your company. These programs are based on years of concentrated experience with companies large and small—and backed by continual research in new methods and up-to-date machine equipment.

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MEETINGS CALENDAR

NOVEMBER

American Institute of Mining, Metallurgical, and Petroleum Engineers—Metals Division Fall Meeting, Morrison Hotel, Chicago, Nov. 3-7.

American Institute of Electrical Engineers—Ninth Annual Machine Tool Conference, Hotel Schroeder, Milwaukee, Wis., Nov. 4-6; Conference on Magnetism & Magnetic Materials, Sheraton Park Hotel, Washington, D. C., Nov. 18-21.

• **Area Power Conference**—Sponsored jointly by the Central Power Electric Cooperative, Minnkota Power Cooperative, Northern States Power Co, and Otter Tail Power Co, Minot, N. D., Nov. 5-6.

Edison Electric Institute—Accident Prevention Committee, Penn-Sheraton Hotel, Pittsburgh, Pa., Nov. 6-8; Southern Region Home Service Workshop, Atlanta, Ga., Nov. 12-13; Commercial Lighting Committee, Washington, D. C., Nov. 14-15; Accounting Division Advisory and Executive Committees, The Cloisters, Sea Island, Ga., Nov. 14-15; Street Lighting Committee, Dayton, Ohio, Nov. 21-22; Industrial Power & Heating Group, Atlantic City, N. J., Nov. 21-22.

Pacific Coast Electrical Association—Hawaiian Conference, Reef Hotel, Honolulu, Hawaii, Nov. 7-8; Services Section, Villa Hotel, San Mateo, Calif., Nov. 13-14.

Pennsylvania Electric Association—Prime Movers Committee, Bedford Springs Hotel, Bedford, Pa., Nov. 7-8; System Planning Committee, Van Curler Hotel, Schenectady, N. Y., Nov. 7-8; Electrical Equipment Committee, Ben Franklin Hotel, Philadelphia, Pa., Nov. 14-15.

• **The Illinois Bar Association**—Public Utilities Law Section Conference on Power, Hotel Sherman, Chicago, Ill., Nov. 8.

Institute of Radio Engineers—Third Annual Instrumentation Conference, Atlanta Biltmore Hotel, Atlanta, Ga., Nov. 11-13; Radio Fall Meeting, King Edward Hotel, Toronto, Canada, Nov. 11-13; Mid-America Electronic Convention, Municipal Auditorium, Kansas City, Mo., Nov. 13-14; New England Radio Engineering Meeting, Mechanics Bldg., Boston, Massachusetts, November 15-16.

National Electrical Manufacturers Association—Traymore Hotel, Atlantic City, N. J., Nov. 11-15.

American Standards Association—Eighth National Conference, St. Francis Hotel, San Francisco, Calif., Nov. 13-15.

Southeastern Electric Exchange—Accident Prevention Committee, Dinkler-Tutwiler Hotel, Birmingham, Alabama, November 14-15.

American Society of Refrigerating Engineers—44th Semi-annual Meeting, Shoreland Hotel, Chicago, Illinois, November 14-16.

Canadian Electrical Association—Western Zone, General & Sales Divisions Meeting, Saskatchewan Hotel, Regina, Nov. 14-15; Engineering Division Meeting, Macdonald Hotel, Edmonton, Nov. 18-19.

Air Conditioning & Refrigeration Institute—10th Exposition, International Amphitheatre, Chicago, Ill., Nov. 18-21.

Electric Companies Public Information Program—Inter-Regional Committee, Mayflower Hotel, Washington, D. C., Nov. 19; Copy Group Meeting, N. W. Ayer Studio, New York City, Nov. 20.

Public Utilities Association—Region II Annual Conference, Mayflower Hotel, Washington, D. C., Nov. 21-22.

DECEMBER

American Society of Mechanical Engineers—Annual Meeting, Statler Hotel, New York City, Dec. 1-6.

American Mining Congress—Annual Membership Meeting, New York, N. Y., Dec. 2.

Edison Electric Institute—Accounting Division Electronics Seminar, sponsored jointly with AGA, Sheraton Cadillac Hotel, Detroit, Mich., Dec. 2-4; Electric Space Heating and Air Conditioning Committee, Cincinnati, Ohio, Dec. 4-6; Industrial Relations Committee, sponsored jointly with New England Personnel Group, Sheraton Plaza Hotel, Boston, Mass., Dec. 5-6; Market Research Committee, Louisville, Ky., Dec. 5-6; Accounting Division Depreciation Committee, sponsored jointly with AGA, Lord Baltimore Hotel, Baltimore, Md., Dec. 9-10; Commercial Cooking & Water Heating Committee, Detroit, Mich., Dec. 12-13.

• **Interstate Power Club**—Hotel Martinique, New York City, Dec. 9.

Electric Companies Public Information Program—Steering Committee, Palmer House, Chicago, Ill., Dec. 10.

Electric Companies Advertising Program—Management Group, Palmer House, Chicago, Ill., Dec. 12.

JANUARY—1958

• **International Home Furnishings Market**—Including Appliance Show, The Merchandise Mart, Chicago, Illinois, January 6-7.

• **Industrial Heating Equipment Association**—Penn Sheraton Hotel, Pittsburgh, Pa., Jan. 27-28.

• **American Society of Heating and Air-Conditioning Engineers**—64th Annual Meeting, Penn-Sheraton Hotel, Pittsburgh, Pa., Jan. 27-29.

• **Home Improvement Products Show**—Hotel Sherman, Chicago, Ill., Jan. 27-29.

FEBRUARY

• **National Rural Electric Cooperative Association**—Annual Meeting, Dallas, Texas, Feb. 2-6.

• **Edison Electric Institute**—Industrial Electrification Heating Conference, co-sponsored by Industrial Electric Council, Cincinnati, Ohio, Feb. 3-6.

• **American Institute of Electrical Engineers**—Winter General Meeting, Hotel Statler, New York City, Feb. 3-7.

• **Missouri Valley Electric Association**—Industrial & Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 6-7.

• NATIONAL ELECTRICAL WEEK WILL BE OBSERVED FEBRUARY 9-15.

• Additions this week.

"Salesman of the Week" If you can identify this Kuhlman representative, notify Dept. SA-1, Kuhlman Electric Co., Birmingham, Michigan

"This BEND makes lighter distribution transformers possible...."

"Primarily, the core determines the weight and size of a distribution transformer. Low-loss cores require less core steel, less copper in the windings, smaller tanks, less cooling oil and ultimately result in a reduction of overall dimensions.

"The problem then is to design lighter, smaller cores. How is it done?

"Well, actually, the solution was found more than a quarter of a century ago. It was then that Kuhlman first introduced the revolutionary idea of bending core iron to provide a continuous low-loss path for magnetic flux. This Kuhlman invention, utilizing the characteristics of grain-oriented steel, has been the basis of core development since.

"In recent times, bent iron cores, as opposed to stacked-lamination designs, have been responsible for such major improvements as: 100 KVA reduced to the former weight of a 75 KVA unit—75 KVA to the former weight of a 50 KVA unit, and so on down the line.

"Today, virtually all transformer manufacturers use some form of bent iron core. The original Kuhlman name 'Bent Iron' core is well worth remembering—for in all its adaptations, it's still the ***Bend*** that is the key to today's lightweight distribution transformers."

5720A

KUHLMAN ELECTRIC COMPANY

GENERAL OFFICES: Birmingham, Michigan

DID MACY'S TELL GIMBELS

about those wonderful MARCUS transformers

We don't know . . . but both of these nationally famous department stores use Marcus Transformers for power and lighting distribution.

Marcus "Mark of Quality" transformers GUARANTEE trouble-free service and safe, dependable operation. For bigger profits and greater customer satisfaction, use MARCUS for your next installation.

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Representatives in Principal Cities

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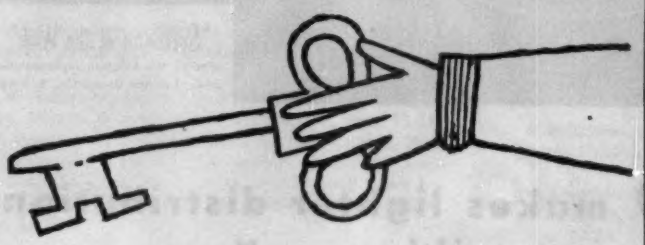

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ELECTRICAL WORLD
330 W. 42nd St., New York 36, N. Y.

Relays Prevent Shutdowns

(*Continued from page* 74)

settings, and the remaining 300-Mw is given priority 1 and not included in the load shedding. Division of the 200 Mw of load is shown in the accompanying table.

Several means of restoring loads shed through operation of the underfrequency relays were examined. Because of the complexity of the restoration schemes, manual restoration was selected.

Standardization Helps

Standardization of relays and frequency settings provides the greatest simplicity and reliablity along with the least maintenance. To maximize these benefits and lower first costs, relay panels and arrangements were also standardized so that they could be mass produced.

This standard panel is so designed that it can be used at all locations where automatic load recovery is to be applied. It consists of three underfrequency relays, their auxiliary tripping relays, ac and dc indicating lamps, and the feeder selector switches. Each selector switch is used to change the frequency setting of a given feeder or remove it from the tripping schedule should its priority rating change.

Fig 6 shows the ac and dc elementary diagram for an automatic load-recovery panel. When the frequency drops to the setting of the resonant unit, the underfrequency relay energizes the auxiliary time-delay relay. After 6-cycles time delay the seal-in coil is picked up. It seals itself in and energizes the auxiliary tripping relay that trips the feeders assigned the particular frequency setting. Automatic reclosure circuit of feeder breakers are blocked by the auxiliary tripping relay.

Relays Set at Factory

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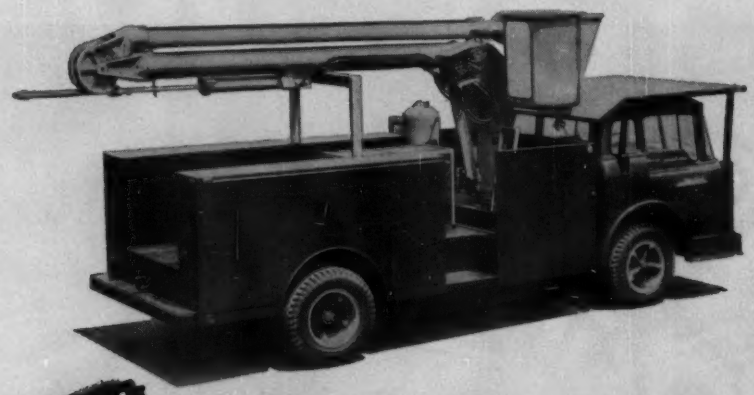

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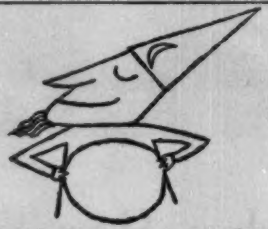

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• **BREAKERS & LOAD CENTERS:** New GE lines of residential plug-in circuit breakers & circuit breaker load centers are described in bulletin GEA-6661 (12 pages). Available from Circuit Protective Devices Dept, Distribution Unit, General Electric Co, Plainville, Conn.

• **MAINTENANCE PRODUCTS:** Martindale Electric Co, 1371 Hird Ave, Cleveland 7, Ohio, has published a 64-page catalog on electrical and mechanical maintenance equipment, safety equipment, and metalworking tools. Ask for catalog 31.

• **LOAD SURVEY RECORDERS:** Bulletin 42-501 from Westinghouse Electric Corp describes five types of recorders for surveying load characteristics. Copies may be obtained by writing the manufacturer, Box 2099, Pittsburgh 30, Pa.

• **SOLENOID VALVES:** The Automatic Switch Co of Florham Park, N. J., has published a 114-page, indexed catalog (No. 25) of their line of solenoid valves.

• **SILICONE RUBBER:** A brochure devoted to the insulating properties of "Silastic" silicone rubber has been issued by Dow Corning Corp., Midland, Mich. Its number is 9-105.

• **SIGNALLING CONTROLLER:** Preliminary data sheet on thermocouple "Electromax" signalling controller for two-position control of electric furnaces, ovens, and kilns is available from Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa.

• **MAGNETIC DRIVE:** "Ampli-Speed" is an eddy current clutch device providing ac speed changing and automatic speed control for pumps, frequency changers, etc. It is described in bulletin 4400-PRD-243 from Electric Machinery Mfg Co, 800 Central Ave, Minneapolis 13, Minn. (2 pp).

• **LIMIT CONTROLLERS:** A 4-p folder on Daytronic Corp's models 561 and 562 for automatic control of weight, force, flow, stress, acceleration, and other physical quantities can be obtained from the company, 216 S. Main St, Dayton 2, Ohio.

• **MISCELLANEOUS:** These bulletins are available from S. Morgan Smith Co, York, Pa. Requests should be on company letterhead and individual's position and complete address included:

Water control gates—Bulletin No. 163 describes types of gates and their applications.

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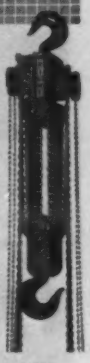

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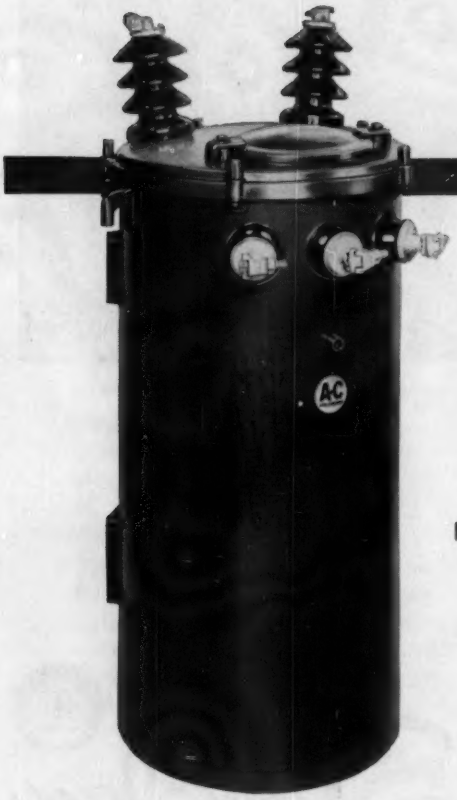

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